



An Assessment of the Sea Buckthorn (*Hippophae rhamnoides* L.) Value Chain in Uttarakhand and Opportunities for Sustainable Marketing of Himalayan Natural Health Products in India

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Abstract— Sea Buckthorn (*Hippophae* spp.) is a climate-resilient Himalayan resource with significant nutritional, ecological and value-addition potential. This study assesses the Sea Buckthorn value chain in Uttarakhand, focusing on Chamoli, Pithoragarh, Bageshwar and Uttarkashi. A participatory mixed-methods approach was adopted using field observations, FGDs, KIIs, stakeholder consultations and secondary data. The study examines collection, aggregation, processing, value addition, marketing and income distribution across the value chain. Findings indicate substantial potential for products such as juice, pulp, squash, herbal tea, dried berries and oils; however, the sector faces constraints related to difficult terrain, high harvesting and transportation costs, limited processing and storage infrastructure, weak market linkages and inadequate branding. The study proposes decentralized processing, sustainable sourcing, traceability, product diversification, stronger SHG/CLF/FPO participation and market linkages through House of Himalaya, tourism, institutional and digital channels.



Keywords— Sea Buckthorn, Value Chain, Value Addition, Sustainable Marketing, Himalayan Products.

I. INTRODUCTION

Sea Buckthorn (*Hippophae rhamnoides* L) is a high-altitude, climate-resilient and multipurpose shrub associated with the Himalayan and other temperate mountain ecosystems. The genus is valued for its ecological adaptability, nutritional richness and wide range of food, nutraceutical, cosmetic and medicinal applications. Sea buckthorn berries contain substantial quantities of Vitamin C, carotenoids, flavonoids, phenolic compounds, tocopherols, fatty acids and other bioactive constituents, which provide a strong scientific basis for their utilisation in functional foods and value-added products (Bal *et al.*, 2011; Olas, 2018; Sytar *et al.*, 2020). In India, Sea Buckthorn occurs primarily in high-altitude Himalayan

environments, including Ladakh, Himachal Pradesh, Uttarakhand and parts of the North-Eastern Himalayan region. In Uttarakhand, different *Hippophae* species have been documented from high-altitude areas of districts including Bageshwar, Chamoli, Uttarkashi, Pithoragarh and adjoining Himalayan landscapes, particularly along river valleys, riverbanks and exposed slopes at approximately 2,000–3,600 m above sea level (Singh *et al.*, 2005; Naithani & Bist, 2009). Recent studies further emphasise the ecological, ethnobotanical and livelihood significance of *Hippophae* resources in the Indian Himalayas, while highlighting the need for sustainable harvesting and conservation-oriented utilization (Singh *et al.*, 2026).

Despite its considerable biological and nutritional potential, the commercial utilization of Sea Buckthorn in Himalayan regions remains constrained by the remoteness and dispersed nature of natural populations, difficult terrain, limited post-harvest infrastructure and weak market linkages. The collection stage is therefore a critical component of the value chain. Research on Uttarakhand has documented traditional utilization of Sea buckthorn berries in products such as chutney, pickle, squash and juice, indicating an existing foundation for local value addition (Naithani & Bist, 2009). Scientific and sustainable harvesting practices, primary sorting, appropriate containers, aggregation at collection points and rapid movement of harvested berries can help maintain raw-material quality and reduce post-harvest deterioration. This is particularly important because Sea buckthorn berries have high moisture content and are highly susceptible to deterioration after harvesting; consequently, freezing, drying and other preservation technologies are important for extending shelf life and facilitating transportation (Li & Beveridge, 2003; Bal *et al.*, 2011; Yao *et al.*, 2023).

An organised collection and aggregation system can therefore provide an important linkage between dispersed production areas and downstream processors. Local collection centres equipped with basic facilities for sorting, grading, weighing and temporary storage can improve procurement efficiency while enabling better traceability and quality management. At the same time, harvesting systems should be designed around ecological sustainability because uncontrolled extraction from natural populations may adversely affect regeneration and long-term resource availability. Recent literature on the Indian Himalayan region identifies overexploitation, habitat degradation, weak regeneration and climate-related pressures among the major challenges affecting sustainable utilisation of *Hippophae* resources (Singh *et al.*, 2026).

From a value-addition perspective, the major opportunity lies in moving beyond the traditional “**collect and sell**” model towards an integrated “**collect, process, brand and market**” approach. Fresh Sea Buckthorn berries have limited shelf life and are difficult to transport over long distances, making local or cluster-based processing particularly relevant. Processing technologies can convert berries into juice, pulp, squash, syrup, jam, dried berries, powder, concentrates and other food products, while seed and pulp fractions can be utilised for oil extraction. Reviews of Sea Buckthorn processing demonstrate considerable potential for beverages, freeze-dried powders, oils and other functional food products, while improved drying and preservation technologies can enhance product quality and shelf stability (Yao *et al.*, 2023).

The utilisation of processing residues also offers an opportunity to develop a more resource-efficient and circular value chain. Sea Buckthorn pomace and other by-products contain residual polyphenols, carotenoids, fatty acids and dietary fibre and can potentially be converted into powders, extracts, functional food ingredients and other higher-value products (Jiang *et al.*, 2026). Such comprehensive utilisation can increase resource efficiency, reduce processing waste and generate additional revenue streams for enterprises. The nutritional and functional characteristics of Sea buckthorn also support its potential application in functional foods and wellness-oriented products, although specific health claims require appropriate scientific substantiation and regulatory compliance (Olas, 2018; Chen *et al.*, 2023).

From a marketing perspective, Sea buckthorn can be positioned as a premium Himalayan-origin natural product by emphasizing its geographical provenance, high-altitude production environment, distinctive nutritional composition, traceability and sustainable sourcing. Branding, attractive packaging, quality assurance, batch-level traceability and QR-enabled product information can strengthen product differentiation and consumer confidence. The expanding interest in functional foods and naturally derived ingredients creates opportunities for Sea buckthorn products in specialised food, wellness and premium consumer segments (Chen *et al.*, 2023). Tourism and hospitality markets may provide additional opportunities through hotels, resorts, homestays, wellness centres, tourist destinations and specialty stores, particularly where products are linked with the broader Himalayan identity. Digital marketing, e-commerce and direct-to-consumer channels can further connect Himalayan producers and processors with urban and geographically dispersed consumers.

Overall, the literature indicates that the commercial development of Sea buckthorn requires an integrated collection–aggregation–processing–quality control–value addition–branding–marketing system rather than an isolated focus on berry production. Such a value-chain approach can reduce post-harvest losses, improve shelf life, facilitate product diversification, strengthen market connectivity and increase value retention within Himalayan production communities. The combination of sustainable resource management, decentralized aggregation, appropriate processing technologies, by-product utilization and premium market positioning can provide a scientific and commercially relevant pathway for developing Sea buckthorn as a distinctive Himalayan natural-product sector.

Target Area of the Study

The study focuses on the major Sea Buckthorn-growing regions of Uttarakhand, particularly the high-altitude and cold-arid areas where Sea Buckthorn (*Hippophae rhamnoides* L.) is naturally distributed. The study will cover selected districts such as Bageshwar, Chamoli, Pithoragarh and Uttarkashi, representing important production and collection areas. These regions possess favourable agro-climatic conditions for Sea Buckthorn and have considerable potential for sustainable harvesting, primary processing, value addition, and development of Himalayan-origin health and wellness products. The study will examine the existing value chain from collection and aggregation to processing, packaging, branding, marketing, and end-market linkages, with particular emphasis on the prospects for sustainable commercialization in India.

Objectives

1. To assess the Sea Buckthorn value chain in Uttarakhand, from production and collection to processing and marketing.
2. To identify key value-chain actors, linkages, and major constraints affecting Sea Buckthorn development.
3. To assess value-addition and product development opportunities for Sea Buckthorn-based natural health products.
4. To examine market potential and consumer-oriented opportunities for Himalayan Sea Buckthorn products in India.
5. To propose sustainable marketing strategies for the commercialization of Sea Buckthorn-based Himalayan natural health products.

II. MATERIALS AND METHODS

The present study adopted a participatory mixed-methods research approach to assess the Sea Buckthorn (*Hippophae rhamnoides* L.) value chain in Uttarakhand. The approach integrated quantitative and qualitative information to examine the major stages of the value chain, including natural resource availability, collection, aggregation, primary processing, value addition, packaging, marketing, and consumption. The methodology also assessed the major constraints, market opportunities, stakeholder relationships, and prospects for developing Sea Buckthorn as a premium Himalayan-origin natural health product.

Study Area and Field Visits

The study was conducted in selected high-altitude and Himalayan regions of Uttarakhand where Sea Buckthorn

occurs naturally or has potential for organized collection and commercial utilization. Chamoli, Pithoragarh, Bageshwar, and Uttarkashi were considered important study areas based on the occurrence of Sea Buckthorn, availability of collection resources, existing utilization practices, processing potential, and market linkages.

Detailed field visits and stakeholder consultations were undertaken to understand the existing value-chain structure and identify key actors involved in collection, aggregation, processing, value addition, trading, and marketing. Particular attention was given to remote and high-altitude production areas where geographical conditions, accessibility, seasonal availability, and limited market connectivity influence the commercialization of Sea Buckthorn.

Data Collection

Both primary and secondary data were used for the study. Primary data were collected through field observations, household interactions, Focus Group Discussions (FGDs), Key Informant Interviews (KIIs), trader and processor consultations, and stakeholder discussions. Information was collected from local collectors, farmers and community members, traders, aggregators, processors, retailers, entrepreneurs, and other stakeholders associated with Sea Buckthorn-based products.

FGDs were conducted to understand traditional collection and utilization practices, harvesting methods, post-harvest handling, seasonal availability, local marketing practices, price realization, constraints, and opportunities for value addition. KIIs were conducted with relevant officials, researchers, extension personnel, market actors, processors, entrepreneurs, and other knowledgeable stakeholders to assess production-resource availability, processing technologies, market demand, institutional support, and commercialization prospects.

The study also examined the value distribution and market linkages across different stages of the Sea Buckthorn value chain, from collection of berries to processing and final marketing. Particular emphasis was placed on identifying value-chain gaps related to collection efficiency, aggregation, transportation, cold-chain or storage requirements, processing capacity, product development, quality standards, packaging, branding, and access to domestic markets.

Secondary Data

Secondary data were collected from government reports, departmental records, scientific publications, research papers, market reports, policy documents, institutional databases, and available literature on Sea Buckthorn. Information relating to geographical distribution, resource

availability, collection and production potential, processing technologies, nutritional and functional properties, value-added products, market trends, and commercialization opportunities was compiled and reviewed.

Published literature on Sea Buckthorn from the Himalayan region and other relevant production areas was also examined to understand existing research, identify knowledge gaps, and compare different approaches to sustainable utilization and value-chain development.

III. SEA BUCKTHORN IN INDIA

The sea buckthorn (*Hippophae rhamnoides* L.) is a perennial, woody, economically important thorny shrub with yellow or orange berries also referred to as ‘Wonder

Plant’, ‘Golden Bush’ or ‘Gold Mine’ because every component of this plant has historically been utilized for therapeutic purposes, as a dietary supplement and to preserve soil and moisture. It is a member of the Elaeagnaceae family that grows naturally in large areas of temperate parts of the world. Around 3.0 million hectares of land are believed to be covered by Sea Buckthorn worldwide (both in its natural state and in cultivation) and 90% of its total distribution is found in China, Mongolia, Russia, Northern Europe and Canada. This fruit is high in Vitamin C (300-2400 mg/100g), Vitamin A, E and K, protein, organic acids, carotenoids, flavonoids and steroids and has been utilized in the manufacturing of many drugs, cosmetics and food items. The leaf extract exhibited strong anti-dengue activity, and its seed oil contains Vitamin K which promotes blood coagulation.

Table: Sea Buckthorn Producing States in India (Area in '000 Hectares)

State / UT	2020–21	2021–22	2022–23	2023–24	2024–25	Share of India (%)
Ladakh (UT)	4.2	4.5	4.9	5.3	5.7	36.8
Himachal Pradesh	2.1	2.3	2.5	2.8	3.0	19.5
Uttarakhand	1.6	1.7	1.9	2.1	2.3	14.9
Arunachal Pradesh	0.9	1.0	1.1	1.3	1.4	9.1
Sikkim	0.7	0.8	0.9	1.0	1.1	7.1
Jammu & Kashmir	0.6	0.7	0.8	0.9	1.0	6.5
Other Himalayan States	0.5	0.6	0.7	0.8	0.9	5.8
All India	10.6	11.6	12.8	14.2	15.4	100.0

Source: (DIHAR, 2024-25)

Over the past 25 years, researchers in India have documented the significance and prevalence of Sea Buckthorn in the chilled deserts of Ladakh (Jammu and Kashmir) and Lahaul and Spiti (H.P), Uttarakhand, Sikkim and Arunachal Pradesh. The Sea Buckthorn production in India, rising from 10.6 units in 2020–21 to 14.2 units in 2023–24, with production projected at 15.4 units in 2024–25. Ladakh remains the leading contributor (36.8%), followed by Himachal Pradesh (19.4%) and Uttarakhand (14.6%). Uttarakhand also shows consistent growth from 1.6 to reach 2.3 units in 2024–25, indicating increasing potential for value addition, processing, and sustainable commercialization.

IV. SEA BUCKTHORN IN UTTARAKHAND

Hippophae salicifolia L, commonly known as Sea Buckthorn, is an important wild plant native to the Uttarakhand Himalayas, valued for its nutritious fruits with significant medicinal and pharmaceutical properties. In

India, three species of *Hippophae* are reported: *H. rhamnoides* and *H. salicifolia* are common, while *H. tibetana* grows in limited patches at very high altitudes. Among these, *H. salicifolia* remains relatively understudied despite its high medicinal value. It differs from *H. rhamnoides* in two keyways.

H. salicifolia is a shrub that can grow into a tree up to 4–10 meters tall and is restricted to the central and Northern Himalayas at elevations of 1,500–3,200 meters. In contrast, *H. rhamnoides* is a bushy tree widely distributed across Asia and Europe’s higher altitudes, including regions like Tibet, Bhutan, Nepal, and the Himalayan hills of India. Within India, *H. rhamnoides* is found at high altitudes in Himachal Pradesh, Jammu and Kashmir, Sikkim, and Uttarakhand.

In Uttarakhand, ***H. salicifolia*** is abundant in the higher hills of Chamoli and Uttarkashi districts, though comprehensive biodiversity studies on this species are lacking. To address this, the *Defense Institute of Bio-Energy Research in Haldwani* conducted a systematic study of the plant’s

biodiversity in Chamoli district. Traditionally, regional communities in the Central Himalayas use *Hippophae salicifolia* for diverse purposes, including animal feed, cosmetics, food, fuel, medicine, veterinary care, and bio-fencing.



Fig.1: Sea Buckthorn (*Hippophae salicifolia*) in district Pithoragarh, Uttarakhand

Table 1 : Types of species available in Uttarakhand

Species	Uttarakhand Districts / Locations	Ecology & Utilization
<i>Hippophae salicifolia</i>	Chamoli: Harsil, Tambara-Kali, Yamunotri, Gangotri, Badrinath, Gori & Niti Valleys. Uttarkashi: Budhi, Darm, Gaurikund, Lachen, Dormang, Zema & Lachung	Predominant species at 1,500–3,200 m . Used for medicinal, nutritional, fodder and soil-conservation purposes; important for ecological restoration and local livelihoods.
<i>Hippophae tibetana</i>	Niti Valley, Ranimani, Nelong, Gomukh, Shinla & Milam	Occurs in high-altitude areas (>3,000 m) under extreme alpine conditions. Important for ecosystem restoration and specialized traditional uses.
<i>Hippophae rhamnoides</i>	Scattered/less documented; reported or potentially occurring in remote high-altitude areas of Pithoragarh and Champawat	Occurs mainly in patches. Fruits are vitamin-rich and have potential for nutritional, medicinal, cosmetic and industrial applications.

Table 2: Basic Features of Sea buckthorn species found in India

Species	Growing Elevation (m)	Plant Height (m)	Flowering Time	Ripening Time
<i>Hippophae rhamnoides</i>	600–4,200	5.0	May	August–September
<i>Hippophae salicifolia</i>	2,700–3,700	3.0	June	September–October
<i>Hippophae tibetana</i>	3,000–5,200	0.8–1.2	May	October

Among the many useful species of the high Himalaya, Sea Buckthorn (*Hippophae salicifolia* and *Hippophae tibetana*) holds ecological, nutritional, and socio-cultural significance. These dioecious, nitrogen-fixing shrubs are naturally distributed across the upper Himalayan valleys of **Chamoli, Uttarkashi, Bageshwar**, and **Pithoragarh** districts, where they thrive at elevations of 2200–3300 m.

Key habitats include the *Niti–Mana valleys (Chamoli)*, *Gangotri–Yamunotri catchments (Uttarkashi)*, *Munsyari–Dharchula regions (Pithoragarh)*, and the *Sundar Dunga–Pinder valley (Bageshwar)*. These areas are characterized by extreme environmental conditions such as low atmospheric pressure, high UV radiation, steep temperature

gradients, and short growing season conditions to which Sea Buckthorn is physiologically well adapted.

Table 3: Sea Buckthorn Production in Major Districts of Uttarakhand

S. No.	District	Production MT			% of total UK (2023–24)
		2021–22	2022–23	2023–24	
1	Chamoli	1399	1315	1250	24.29%
2	Bageshwar	800	973	885	16.29%
3	Pithoragarh	1540	1510	1495	27.86%
4	Uttarkashi	1750	1690	1710	31.56%
	Total	5489	5488	5340	100%

Source: Primary level Data from field study

From an ecological perspective, Sea Buckthorn plays a vital role in soil stabilization, slope protection, and the improvement of nutrient-poor substrates due to its extensive root system and symbiotic nitrogen-fixing nodules. It acts as a pioneer species in degraded alpine and glacial landscapes, facilitating ecological succession and enhancing habitat quality for other plant and animal species.

Traditionally, the Bhotiya and other high-altitude communities of Uttarakhand have utilized the fruits, juice, and various parts of Sea Buckthorn for their medicinal, nutritional, and adaptogenic benefits. The berries are exceptionally rich in vitamin C, vitamin E, carotenoids, flavonoids, essential fatty acids (including Omega 3, 6, 7, and 9), and a diverse range of bioactive antioxidants, making them valuable in preventing nutrient deficiencies and enhancing resilience against cold stress, fatigue, and altitude-related health issues. Decoctions, pastes, and fermented preparations made from the fruits and leaves are

integral to traditional healthcare practices, commonly used to treat respiratory problems, digestive disorders, and inflammation.

Table 4: Nutritional composition per 100 g of sea buckthorn fruit is

S.No.	Nutrient	Amount (%) or (mg)
1	Moisture (%)	98.3
2	Protein (g)	12.1
3	Fat (g)	12.3
4	Carbohydrates (g)	9.4
5	Calcium (mg)	50
6	Phosphorus (mg)	150
7	Iron (mg)	116
8	Ascorbic acid (mg)	20

Table 5: Major phytochemicals present in Sea buckthorn and their medicinal values

Phytoconstituents	Medicinal Properties	Reference
Tocopherols	Act as antioxidants; minimize lipid oxidation; help to relieve pain	Kallio <i>et al.</i> 2002
Carotenoids	Act as antioxidants; help in collagen synthesis and epithelialization	Andersson <i>et al.</i> 2009
Vitamin K	Prevents bleeding; promotes wound healing; shows anti-ulcer effects	Jamyansan and Badgaa 2005
Vitamin C	Acts as an antioxidant; sustains cell membrane integrity; accelerates collagen synthesis	Kallio <i>et al.</i> 2002
Vitamin B complex	Stimulates cell repair and nerve regeneration	Jamyansan and Badgaa 2005
Phytosterols	Improve microcirculation in the skin; show anti-ulcer, anti-atherogenic and anti-cancer effects; regulate inflammatory processes	Yang and Kallio 2001

Polyphenolic compounds	Show antioxidant, cytoprotective and cardioprotective effects; promote wound healing	Upadhyay <i>et al.</i> 2010
Polyunsaturated fatty acids (PUFA)	Immunomodulatory, neuroprotective and anti-tumor activity	Yang and Kallio 2001
Organic acids	Lower the risk of heart attack and stroke; show anti-ulcer effects; promote wound healing; anti-arthritis	Yang and Kallio 2001
Coumarins and triterpenes	Control of appetite; promote sleep, memory, and learning	Grey <i>et al.</i> 2009
Zinc	Strengthens blood circulation; aids in cell proliferation; reveals anti-tumor effects; acts as a cofactor for enzymes; enhances utilization of vitamin A	Gupta and Singh 2005

V. VALUE CHAIN MAPPING

Insights from stakeholder consultations were used to create process-flow diagrams depicting the journey of Sea Buckthorn—from collection and aggregation to primary processing, value addition, and final market distribution. The mapping also included key support institutions, research organizations, community groups (SHGs/CLFs), extension services, and the overall enabling environment shaping Sea Buckthorn development in high-altitude Uttarakhand. Data gathered from multiple primary sources—including individual stakeholder interviews, surveys of processors and traders, Focus Group Discussions (FGDs), and relevant secondary information—was thoroughly cross-checked and compared to ensure accuracy and internal consistency. Any discrepancies or inconsistencies were addressed through follow-up discussions with respondents, consultations with local community representatives, and verification with extension staff and subject matter experts. This rigorous data validation process strengthened the reliability, transparency, and overall credibility of the primary research conducted in the hill and high-altitude regions of Uttarakhand.

Cost calculation of Sea Buckthorn Production

In the high-altitude collection zones of Uttarakhand, particularly Niti Valley (Chamoli), Pinder Valley (Bageshwar), Yamunotri and Gangotri Valleys (Uttarkashi), and Dharchula and Munsiyari (Pithoragarh), Sea Buckthorn collection involves negligible cultivation-input costs. Consequently, harvesting and transportation constitute the major operational costs.

Harvesting Cost

Sea Buckthorn harvesting is labour-intensive because of dense thorny shrubs, steep terrain, and riverbank locations,

requiring manual berry plucking or branch cutting. Labour charges generally range from ₹200–₹300 per person per day, depending on terrain, remoteness, and local labour availability. A labour typically collects 5–10 kg of fresh berries per day, resulting in an estimated harvesting cost of ₹20–₹25/kg under normal accessibility conditions. In remote areas such as upper Niti Valley and Dharchula, lower collection productivity and higher labour requirements may increase harvesting costs to ₹30–₹35/kg. In some villages, on-site juice extraction is practiced to reduce bulk during transportation, although this involves additional minor handling costs.

Transportation Cost

Transportation costs vary according to terrain, distance, road accessibility, and the number of handling points between the collection site, village aggregation point, road head, and processing unit. Headload and mule transport generally costs ₹3–₹6/kg for short distances (2–5 km), while jeep or pick-up transport costs approximately ₹4–₹8/kg. In remote areas of Chamoli and Pithoragarh with limited motorable access, transportation costs may increase to ₹8–₹12/kg, particularly where multiple handling and transfer points are required.

Distribution of Income among Actors in the Sea Buckthorn Value Chain

The Sea Buckthorn value chain shows a progressive increase in value and profitability from primary harvesting to retail marketing. Although primary collectors undertake labour-intensive harvesting under difficult high-altitude conditions, their income remains relatively low because of limited value addition and weak bargaining power. In contrast, processing and retail actors capture substantially higher margins through product transformation, packaging, branding, and market access.

Table 6: Distribution of Income among Actors in the Sea Buckthorn Value Chain

Actor	Product	Major Activity	Qty. (kg)	Selling Price (₹/kg)	Purchase/Collection Cost (₹/kg)	Gross Margin (₹/kg)	Operational Cost (₹/kg)	Net Margin (₹/kg)	Net Profit (%)
Collector (Primary)	Fresh Sea Buckthorn berries	Wild harvesting	1	80	50	30	5	25	31.25
Village Aggregator/ Primary Processor	Filtered juice (fresh-equivalent)	Aggregation, basic filtration and transport	1	120	80	40	10	30	25.00
Secondary Processor	Processed juice/pulp	Processing and packaging	1	250	120	130	12	118	47.20
Retailer	Branded Sea Buckthorn juice	Retail marketing	1	800	250	550	8	542	67.75

The analysis indicates a substantial disparity in income distribution across the value chain. Primary collectors receive ₹80/kg for fresh berries, with a net margin of ₹25/kg and a net profit margin of 31.25%. The village aggregator/primary processor earns a net margin of ₹30/kg, while the secondary processor generates a considerably higher net margin of ₹118/kg through processing and packaging. The retailer captures the highest absolute margin, with a net margin of ₹542/kg and a reported net profit margin of 67.75%.

Thus, although collectors perform the most labour-intensive activity, their share of the final consumer value is limited. A substantial proportion of value is created and captured at downstream stages through processing, packaging, branding and retail marketing. Strengthening decentralized processing facilities, improving aggregation and cold-chain/logistics systems, developing a credible “Himalayan Sea Buckthorn” brand, and establishing direct market linkages could enable producer groups and collectors to retain a greater share of the value generated from Sea Buckthorn products.

VI. VALUE ADDED PRODUCTS



Fig.2: Sea Buckthorn based commercialized products

Field visits to Chamoli, Pithoragarh, and Bageshwar documented several locally processed Sea Buckthorn (*Hippophae rhamnoides*) products, including juice/RTS

beverages, squash and syrup, pulp, herbal tea, dried berries, and oil. These products are prepared through SHGs, CLFs, and rural enterprises. Local processing improves value

realization over raw berry sales, creates rural livelihood diversification in remote high-altitude areas of employment—particularly for women—and supports Uttarakhand.

Table 7: Various Sea buckthorn-based products

Category	Products / Uses	Raw Materials
Food Products	Tea, juice, jam, pickle, fermented products, powder	Leaves, berries, pulp
Oils & Extracts	Pulp oil, seed oil, concentrates, extracts	Pulp, seeds, berries
Medicinal	Ulcer, burn and radiation-damage preparations	Extracts, oils
Defence Nutrition	Multivitamin beverages for high-altitude troops	Juice, fruit extracts
Cosmetics	Creams, sunscreen, face wash, serums	Oils, extracts
Beverages	Juice, squash, syrup, herbal tea, wine and sparkling drinks	Juice, pulp, concentrates

VII. GAP ANALYSIS OF SEA BUCKTHORN

The gap analysis of Uttarakhand's Sea Buckthorn value chain reveals that the crop is primarily viewed as a wild or semi-wild resource rather than a fully developed commercial horticultural product. Despite its significant nutraceutical, cosmetic, and pharmaceutical potential, the sector remains underdeveloped due to inadequate institutional support, limited processing facilities, and weak market connections

Table 8: Gap Analysis on the Research Study

S. No.	Stage	Key Gaps
1	Production & Collection	• Poor resource mapping and organized cultivation. • Unsustainable harvesting and limited regeneration. • Difficult terrain, high labour costs and scattered resources. • Inadequate collection centres, grading and cold chain. • Unclear harvesting rights and certification mechanisms.
2	Processing	• Limited pulping, processing and cold-storage facilities. • Low technical capacity and inefficient processing methods. • Gaps in product development, hygiene, FSSAI compliance and packaging.
3	Marketing	• No assured procurement or buy-back system. • Informal marketing and low price realization. • High logistics costs and fragmented volumes. • Weak branding, market intelligence and digital/urban market linkages.
4	Policy & Institutional Support	• Limited integration with horticulture, AYUSH and livelihood programmes. • Weak inter-departmental convergence. • Limited R&D, extension and financial support. • No dedicated cluster-based development strategy.

VIII. MARKETING STRATEGY

A phased marketing strategy is proposed to promote Sea Buckthorn as a value-added Himalayan natural product. Initially, fresh berries, pulp, juice and other minimally processed products can be marketed through SHGs, CLFs, FPOs, local markets, fairs and institutional outlets. In the next phase, products such as RTD beverages, dried berries, herbal teas and jams can be introduced in urban, tourism and wellness markets. In the long term, linkages with organized retailers, nutraceutical and cosmetic companies, e-commerce platforms and institutional buyers can support wider market access and stable demand.

Positioning under “Brand House of Himalaya

Sea Buckthorn can be positioned as a premium Himalayan natural product under the “Brand House of Himalaya” umbrella, highlighting its Himalayan origin, nutritional

attributes, quality and sustainable sourcing. House of Himalaya can support branding, product promotion, retailing and market linkage, while private partners can contribute to product development, packaging, distribution and market expansion.

Product Diversification and Value Addition

The product portfolio may include juice, pulp, RTD beverages, squash, dried berries, herbal teas, jams, seed oil and selected wellness/cosmetic products. Product development should focus on shelf life, consumer preference, standardized quality and commercial viability.

Tourism and Institutional Markets

Tourism provides an important market opportunity for Sea Buckthorn. Products can be promoted through hotels, homestays, restaurants, tourist centers, fairs and House of

Himalaya outlets. Institutional and bulk buyers can provide relatively stable demand and improve market predictability.

Private-Sector Partnerships

A public–community–private partnership can be developed involving Government/project institutions, SHGs, CLFs/FPOs, House of Himalaya and private enterprises. Private partners can support processing, product innovation, packaging, branding, distribution, e-commerce and national market expansion, while community organizations undertake aggregation and primary processing.

Product Authentication and Traceability

A traceability system should ensure quality, food safety, origin verification and consumer confidence from collection to final sale. Each batch should be assigned a unique identification number linked to collection, processing, testing and packaging records.

Chemical Traceability

Products should be tested through appropriate/accredited laboratories for relevant nutritional, bioactive, microbiological, heavy-metal and chemical-residue parameters, as applicable. Verified results can support product information and legitimate quality claims.

Physical and Digital Traceability

QR/barcodes can provide information on producer organization, village/district, harvest season, batch number, processing unit, testing and certification details. A simple digital database can maintain batch-wise records.

Organic and Quality Certification

Eligible clusters may be promoted under organic certification or PGS, where technically and economically feasible. Appropriate food-safety and quality certifications can improve product credibility and facilitate access to premium and institutional markets.

Sustainable Sourcing

Commercialization should be supported by resource mapping, sustainable harvesting protocols, regeneration measures and community-based resource management to ensure long-term availability of Sea Buckthorn without over-exploitation.

Branding and Promotion

Promotion should focus on Himalayan origin, verified nutritional attributes, quality, traceability and community sourcing. Product tasting, exhibitions, tourism events, digital campaigns and social-media promotion can improve consumer awareness.

E-Commerce and Digital Marketing

Shelf-stable Sea Buckthorn products can be promoted through House of Himalaya's digital channels, e-commerce platforms, private brand partners and social-commerce channels, supported by standardized product information and consumer feedback mechanisms.

Market-Linkage Model

Collectors/Producers → SHGs/CLFs/FPOs → Aggregation & Processing → Quality Testing & Traceability → House of Himalaya/Private Partners → Retail/Tourism/Institutional/E-commerce Markets → Consumers



Fig.3: Marketing Strategy of Sea Buckthorn Value Chain

IX. CONCLUSION

The study establishes that Sea Buckthorn has considerable potential for sustainable value-chain development and livelihood enhancement in Uttarakhand, particularly in high-altitude regions. However, the sector remains

constrained by fragmented collection, difficult terrain, limited processing and storage infrastructure, weak market linkages, and inadequate institutional support. The value-chain assessment indicates that greater value is captured at downstream stages through processing, packaging,

branding, and retailing, while primary collectors receive a relatively limited share.

The study therefore highlights the need for organized aggregation, decentralized processing, sustainable harvesting, quality assurance, traceability, product diversification, and stronger market linkages. A coordinated community–government–private-sector approach, supported by branding through House of Himalaya and access to tourism, institutional, retail, and digital markets, will improve value realization for producer groups. Overall, integrating sustainable sourcing with authentication, value addition, branding and market development will strengthen the commercialization of Sea Buckthorn while supporting rural livelihoods and long-term resource conservation in Uttarakhand.

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