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Agro-based value addition through organic herbal shampoo- An economic analysis

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Abstract

The growing shift towards natural and sustainable lifestyles has significantly increased the demand for herbal and organic personal care products, particularly in the hair care segment. This study focuses on the development and economic analysis of an agro-based value-added product organic herbal shampoo. Herbal shampoos, formulated using plant-based ingredients such as herbs, essential oils, and natural extracts, offer a safer and eco-friendly alternative to conventional synthetic shampoos, which are often associated with adverse effects due to chemical constituents like surfactants. Increasing environmental pollution and changing lifestyles have led to widespread hair-related problems, thereby driving consumer preference toward chemical-free and health-conscious solutions. Hair, being an essential component of human aesthetics and protection, requires proper care through effective cleansing and nourishment. Herbal formulations not only cleanse but also enhance hair texture, promote scalp health, and provide therapeutic benefits without causing damage. Traditional ingredients like Reetha, Amla, and Shikakai, widely used in Indian folklore, contribute natural cleansing and conditioning properties due to their bioactive compounds such as saponins and vitamins. Despite challenges in achieving performance equivalence with synthetic products, herbal shampoos are gaining acceptance due to their safety, affordability, and minimal side effects. The increasing awareness of health, sustainability, and the harmful impacts of chemical-based products has further strengthened the market potential for herbal cosmetics. Thus, the development of an organic herbal shampoo represents a promising opportunity for agro-based value addition, aligning economic viability with environmental and consumer well-being.

Keywords: Organic herbal shampoo, agro-based value addition, medicinal plants, natural ingredients, sustainable agribusiness

1. Introduction

In recent years, increasing concerns over the adverse effects of synthetic chemicals in personal care products have led to a growing demand for herbal and natural alternatives. Herbal shampoos, formulated using plant-based ingredients, are considered safer, biodegradable, and eco-friendly compared to conventional synthetic shampoos (Deulkar *et al.*, 2023) ^[1]. These formulations utilize medicinal plants known for their therapeutic properties, offering effective cleansing along with nourishment and protection of hair and scalp (Varshney & Kumar, 2024) ^[2].

Hair care has become increasingly important due to rising environmental pollution and associated problems such as dandruff, hair fall, and scalp irritation. Herbal ingredients such as neem, aloe vera, hibiscus, brahmi, and bhringraj possess antimicrobial, conditioning, and hair growth-promoting properties, making them suitable for maintaining scalp health and improving hair quality (Prasanna Kumar *et al.*, 2024) ^[3]. Traditional ingredients like soapnut (reetha), amla, and shikakai are widely used due to their natural saponin content, which provides gentle cleansing without damaging hair structure (Gazi *et al.*, 2025) ^[4].

Furthermore, herbal shampoos often incorporate essential oils such as tea tree and lavender oil, which enhance antimicrobial activity and provide soothing effects (Natarajan *et al.*, 2025) ^[5]. These formulations align with the increasing consumer preference for sustainable, chemical-free, and health-conscious products. Overall, herbal shampoos represent an effective integration of traditional knowledge and modern formulation approaches, offering a promising alternative for safe and sustainable hair care (Thakur *et al.*, 2025) ^[6]. In addition to their cleansing function,

herbal shampoos play a significant role in improving overall scalp health and hair strength. The bioactive compounds present in medicinal plants, such as flavonoids, tannins, saponins, and vitamins, contribute to antifungal, antibacterial, and antioxidant activities, which help in reducing scalp infections and promoting healthy hair growth (Deulkar *et al.*, 2023) ^[1]. These natural constituents enhance blood circulation to the scalp, strengthen hair follicles, and prevent premature hair loss, making herbal formulations more beneficial than synthetic alternatives (Varshney & Kumar, 2024) ^[2].

Moreover, the formulation of herbal shampoos focuses on the use of mild surfactants derived from natural sources, which provide effective cleansing without stripping the natural oils of the scalp. This ensures better moisture retention and reduces dryness and irritation commonly associated with chemical-based shampoos (Prasanna Kumar *et al.*, 2024) ^[3]. The inclusion of conditioning agents such as plant oils and proteins further improves hair texture, shine, and manageability, enhancing the overall performance of the product (Gazi *et al.*, 2025) ^[4]. The growing popularity of herbal shampoos is also associated with their eco-friendly and sustainable nature. Unlike synthetic products, herbal formulations are biodegradable and derived from renewable resources, reducing environmental pollution and promoting green consumerism (Natarajan *et al.*, 2025) ^[5]. In addition, the use of plant-based ingredients supports agricultural value addition and encourages the utilization of locally available medicinal plants, thereby contributing to rural development and sustainable agribusiness practices (Thakur *et al.*, 2025) ^[6]. Despite their advantages, herbal shampoos face certain challenges, including variability in efficacy, shorter shelf life, and lack of standardization in formulations. However, continuous research and advancements in formulation techniques are helping to overcome these limitations and improve product stability and effectiveness (Bandil *et al.*, 2025). With increasing consumer awareness and demand for natural products, herbal shampoos are expected to play a vital role in the future of the personal care industry, combining traditional knowledge with modern scientific approaches.

Objectives

- To critically examine the economic viability of an organic herbal shampoo enterprise through systematic financial appraisal techniques.
- To determine the capital investment structure, operational costs, and revenue generation potential associated with the proposed business model.
- To analyze the financial performance indicators, including profitability, return on investment.

2. Methodology

The present study adopts a descriptive and analytical approach to develop and evaluate an organic herbal shampoo enterprise by integrating formulation techniques with economic analysis. High-quality herbal raw materials such as neem (*Azadirachta indica*), aloe vera (*Aloe barbadensis*), hibiscus (*Hibiscus rosa-sinensis*), brahmi (*Bacopa monnieri*), and bhringraj (*Eclipta alba*), along with traditional cleansing agents like soapnut (*Sapindus mukorossi*), amla (*Phyllanthus emblica*), and shikakai (*Acacia concinna*), were selected based on their therapeutic properties and availability. The plant materials were thoroughly washed, shade-dried, and pulverized into coarse powder to facilitate extraction of bioactive compounds. The active constituents were extracted using aqueous and mild heat extraction methods, followed by filtration to obtain clear herbal extracts rich in phytochemicals. A shampoo base was then prepared using purified water and mild biodegradable

surfactants, to which natural conditioning agents such as plant oils and proteins were added to enhance hair texture and moisture retention.

The herbal extracts were gradually incorporated into the base under continuous stirring to ensure uniform blending, followed by the addition of aloe vera gel for conditioning and essential oils like tea tree and lavender for antimicrobial activity and fragrance. The formulated shampoo was evaluated for quality parameters including pH, viscosity, foaming ability, stability, appearance, and skin safety to ensure product effectiveness and consumer acceptability. The final product was filled into sterilized, eco-friendly containers and labeled as per regulatory standards. Furthermore, the economic feasibility of the enterprise was assessed using financial tools such as

I. Payback period Formula

$$\text{Payback Period (P)} = I \div E$$

Where:

P = Payback period (years)

I = Initial investment (₹)

E = Average annual net income (₹)

Decision Rule:

If payback period < n years → Accept the project

If payback period > n years → Reject the project

II. Net present value (NPV)

$$NPV = \sum_{i=1}^n Y_i * \text{discount factor (r)} - \text{Investment (I)}$$

Y_i = Net cash flows during year

I = Initial investment

r = Discount rate

i = Time period (1, 2, ... n)

Decision rule:

If NPV is positive, then accept the project.

If NPV is negative, then reject the project

III. Internal rate of return (IRR)

IRR = (lower discount rate) + (difference between the two discount rate * present worth of cash flow at lower rate / absolute difference two cash flow at different discount rate)

Decision Rule

If IRR > Cost of Capital (Rate of Interest) → Accept the project

If IRR < Cost of Capital → Reject the project

IV. Benefit–cost ratio (BCR)

BCR = present value of benefit / present value of cost

Decision Rule:

If BCR > 1, then accept the project

If BCR < 1, then Reject the project.

Market potential and business sustainability were analyzed through SWOT and PESTLE frameworks along with market segmentation and targeting strategies. Both primary observations from formulation and secondary data from research articles and reports were utilized to ensure scientific validity and practical applicability of the study.

Manufacturing Process of Organic Herbal Shampoo

The manufacturing process of organic herbal shampoo involves a series of systematic steps to ensure the extraction of beneficial plant compounds and the preparation of a safe, effective, and stable product. The process begins with the selection of high-quality raw materials, including medicinal herbs such as neem,

aloe vera, hibiscus, brahmi, and bhringraj, along with traditional cleansing agents like soapnut (reetha), amla, and shikakai. These ingredients are chosen based on their natural cleansing, conditioning, and therapeutic properties.

The selected herbs are then cleaned thoroughly to remove dust, dirt, and impurities. After washing, they are shade-dried to preserve sensitive bioactive compounds that may degrade under direct sunlight. Once dried, the materials are crushed or ground into coarse powder, which increases the surface area and facilitates efficient extraction of active constituents.

The next step is herbal extraction, where the powdered materials are boiled or soaked in water using mild heat treatment. This process helps in extracting important phytochemicals such as saponins, flavonoids, and vitamins responsible for cleansing and nourishing actions. The extract is then filtered to remove solid residues, resulting in a clear herbal solution.

Simultaneously, a shampoo base is prepared by mixing purified water with mild, plant-based surfactants that provide cleansing action without harming the scalp. To this base, natural conditioning agents such as coconut oil, jojoba oil, or proteins are added to improve hair softness, strength, and moisture retention.

The prepared herbal extract is then slowly added to the shampoo base under continuous stirring to ensure uniform mixing. Additional ingredients such as aloe vera gel are incorporated for hydration, while essential oils like tea tree oil and lavender oil are added for their antimicrobial properties and pleasant fragrance. The mixture is blended until a homogeneous consistency is achieved.

After formulation, the shampoo undergoes quality control testing, including checking pH (to match scalp conditions), viscosity (for proper thickness), foaming ability, stability, and overall appearance. This ensures that the product is safe, effective, and user-friendly.

Finally, the shampoo is filled into clean, sterilized, eco-friendly containers using hygienic methods. Proper labeling is done, including ingredient details, manufacturing and expiry dates, and usage instructions. The finished product is then stored in a cool, dry place to maintain its quality and shelf life before being distributed to the market.

3. Results

Business Environment

Swot Analysis

1. Strengths

- The shampoo is formulated using herbal ingredients such as neem, aloe vera, hibiscus, brahmi, and bhringraj, which enhances product safety and consumer trust.
- Rising awareness about chemical-free personal care products increases acceptance and demand for organic herbal shampoos.
- The use of well-known medicinal herbs provides cultural credibility and long-term consumer confidence.
- The enterprise promotes environmentally responsible practices, including biodegradable ingredients and eco-friendly packaging.

2. Weakness

- Higher Production Cost Compared to Synthetic Shampoos.
- Absence of strong chemical preservatives may reduce product shelf stability.
- As a new enterprise, building brand awareness and consumer trust may take time.
- Fluctuations in supply of herbal raw materials can affect production continuity

3. Opportunities

- Increasing consumer shift towards natural and chemical-free products offers strong growth potential.
- Greater concern about scalp health, hair damage, and environmental safety creates demand for herbal shampoos.
- Online platforms enable wider market reach, brand visibility, and direct consumer engagement.
- Policies promoting small-scale, organic, and sustainable businesses provide financial and institutional support

4. Threats

- Large multinational and domestic brands with strong marketing power may affect market entry.
- Higher prices of organic shampoos may limit adoption among low-income groups.
- Presence of misleading “herbal” claims by competitors may reduce consumer trust.
- Seasonal variation and supply constraints of herbs can impact production cost. Changes in cosmetic regulations and certification requirements may increase compliance burden.

Pestle Analysis

1. Political factors

- Government initiatives supporting MSMEs, startups, and women entrepreneurship encourage small-scale cosmetic enterprises.
- Promotion of Ayurveda, herbal, and organic industries through national policies strengthens market confidence.
- Export promotion policies for herbal and Ayurvedic products create international business opportunities.
- Stability in political environment supports long-term investment in agribusiness ventures.

2. Economic Factors

- Rising disposable income increases consumer spending on premium and organic personal care products.
- Inflation and raw material price fluctuations may impact production costs.
- Small-scale production allows flexible pricing strategies during market entry.
- Increasing contribution of the personal care sector to the Indian economy supports long-term growth.

3. Social Factors

- Increasing awareness about health, wellness, and chemical-free lifestyles drives consumer preference.
- Traditional trust in herbal and Ayurvedic ingredients enhances product acceptance.
- Changing grooming habits among men and women increase regular shampoo usage.
- Influence of social media and peer recommendations impacts purchasing decisions.

4. Technological Factors

- Availability of improved herbal extraction and formulation technologies enhances product quality.
- Use of digital marketing platforms improves brand visibility and customer reach.
- E-commerce technology facilitates direct-to-consumer sales and feedback collection.
- Advancements in packaging technology improve product shelf life and safety.

5. Legal Factors

- Adherence to GMP and BIS standards ensures product quality and safety.
- Proper labeling as per Legal Metrology Rules is essential for consumer transparency.
- Organic certification requirements must be met for genuine organic claims.
- GST registration and tax compliance are necessary for smooth business operations.

6. Environmental Factors

- Use of biodegradable and natural ingredients reduces environmental impact.
- Eco-friendly packaging supports sustainability goals.
- Sustainable sourcing of herbs encourages biodiversity conservation.

Market Mix

1. Product

- Organic herbal shampoo formulated using neem, aloe vera, hibiscus, brahmi, bhringraj, tea tree oil, and lavender oil.
- Free from harmful chemicals such as sulphates, parabens, and synthetic colors.
- Suitable for different hair types and common scalp problems.
- Available in eco-friendly and hygienic packaging with proper labeling.

2. Price

- Adoption of a value-based and competitive pricing strategy.
- Priced slightly higher than synthetic shampoos due to organic ingredients.
- Flexible pricing for bulk buyers such as salons and retailers.
- Occasional promotional discounts to attract new customers.

3. Place

- Distribution through local grocery stores and organic product outlets.
- Availability in pharmacies and medical stores.
- Supply to salons, beauty parlors, and wellness centers.
- Sales through e-commerce platforms and company websites.
- Direct-to-consumer sales with home delivery facilities.

4. Promotion

- Promotion through social media platforms and digital marketing.
- Product awareness campaigns highlighting herbal and organic benefits.
- Use of influencer and customer testimonials to build trust.
- Free samples and demonstrations in salons and retail outlets. Attractive ecofriendly packaging and labeling as a promotional tool.

Table 1: Investment Pattern

Items	Approximate Cost
Rented processing shed / unit	₹5,00,000
Minor construction, plumbing, hygiene setup	₹5,00,000
Subtotal	₹10,00,000
Machinery & Equipment	
Mixing & blending tanks (SS)	₹7,00,000
Shampoo manufacturing vessel	₹5,00,000
Heating system & stirrers	₹3,00,000
Filling & sealing machine	₹4,00,000
Labeling & packing equipment	₹2,00,000
Raw Materials	
Herbal extracts (Aloe, Neem, Amla, Shikakai, Reetha)	₹3,00,000
Natural surfactants & preservatives	₹2,00,000
Essential oils & fragrances	₹1,00,000
Bottles, caps & labels	₹2,00,000
Manpower & Salaries	
Production supervisor	₹2,40,000
2 Skilled workers	₹3,60,000
Helpers (2)	₹2,00,000
Admin & sales staff	₹1,50,000
Licence & Legal Compliance	
Company registration	₹40,000
AYUSH / Cosmetic manufacturing licence	₹1,50,000
Pollution Control Board	₹75,000
BIS / ISO / GMP certification	₹1,25,000
Legal & consultancy	₹60,000
Marketing & Distribution	
Brand name & packaging design	₹1,50,000
Website & social media marketing	₹1,00,000
Promotional campaigns & samples	₹1,50,000
Contingency & Miscellaneous	
Utilities, transport, insurance	₹1,00,000
Buffer for unexpected expenses	₹1,00,000

Table 2: Investment Pattern Summary

Component	Amount
Land & building	₹10,00,000
Machinery & equipment	₹21,00,000
Raw materials	₹8,00,000
Manpower	₹9,50,000
Licence & legal	₹4,50,000
Marketing	₹4,00,000
Contingency	₹2,00,000
TOTAL	₹50,00,000

The investment pattern presented in Table 1 indicates that a significant portion of the initial capital is allocated towards infrastructure and machinery, which are essential for establishing a functional shampoo manufacturing unit. The cost of rented processing shed and minor construction together amounts to ₹10,00,000, highlighting the importance of basic facilities and hygiene setup in ensuring quality production.

Machinery and equipment constitute the largest share of the total investment, amounting to ₹21,00,000 as summarized in Table 2. This includes mixing tanks, manufacturing vessels, heating systems, and filling machines, which are crucial for efficient and large-scale production. The high investment in machinery reflects the need for maintaining product consistency, quality standards, and operational efficiency.

Raw materials such as herbal extracts (Aloe, Neem, Amla, Shikakai, Reetha), surfactants, and packaging materials account for ₹8,00,000, indicating the importance of quality inputs in producing a marketable herbal shampoo. Manpower costs, including salaries for supervisors, skilled workers, and helpers, are moderate, showing that the unit is semi-automated with a balanced dependency on labor and machinery.

Further, expenses related to licensing, legal compliance, and certifications (₹4,50,000) demonstrate the necessity of adhering to regulatory standards such as AYUSH and BIS for product approval and market acceptance. Marketing and distribution costs (₹4,00,000) also play a key role in brand development and customer outreach, ensuring product visibility in a competitive market.

Overall, the total project investment of ₹50,00,000 reflects a well-structured financial plan with appropriate allocation across infrastructure, production, compliance, and marketing. The inclusion of contingency funds ensures financial stability and preparedness for unforeseen expenses, making the project economically feasible and sustainable.

Project Appraisal Payback Period

Table 3: Net income received for the following years

Year	Net income
Year 1	10,00,000
Year 2	12,00,000
Year 3	14,00,000
Year 4	16,00,000
Year 5	18,00,000.

Initial Investment= 50lakhs

Table 3: Cumulative net income pattern

Year	Net income	Cumulative Income
1	10,00,000	10,00,000
2	12,00,000	22,00,000
3	14,00,000	36,00,000
4	16,00,000	52,00,000

Exact Payback Period Calculation

After 3 years, remaining investment = ₹14,00,000

Net income during 4th year = ₹16,00,000

The payback period analysis indicates that the initial investment of ₹50,00,000 is recovered within approximately 3.6 years. The cumulative cash inflows show a steady increase over the years, reaching ₹36,00,000 by the end of the third year and surpassing the initial investment during the fourth year. This relatively short payback period reflects the project's strong earning capacity and efficient capital recovery. Since the investment is recovered well within the acceptable time frame of 4 years, the project can be considered financially viable with moderate risk and good liquidity prospects.

Net Present Value (NPV)

Table 4: Indicating the Net Present Values

Year	Cash flow	Discount factor	Present value
1	10,00,000	0.91	9,10,000
2	12,00,000	0.83	9,96,000
3	14,00,000	0.75	10,50,000
4	16,00,000	0.68	10,88,000
5	18,00,000	0.62	11,16,000
Total			₹51,60,000

NPV=51,60,000-50,00,000 = 1,60,000

The Net Present Value (NPV) of the project is calculated to be ₹1,60,000, which is positive. A positive NPV indicates that the present value of future cash inflows exceeds the initial investment, thereby adding value to the project. This suggests that the project is expected to generate returns higher than the assumed discount rate, making it economically profitable. Hence, based on the NPV criterion, the project is financially feasible and should be accepted as it ensures wealth maximization.

Internal Rate of Returns (IRR)

Table 5: Indicating the Internal Rate of Returns

Year	Net cash flow
0	-
1	10,00,000
2	12,00,000
3	14,00,000
4	16,00,000
5	18,00,000
Total	70,00,000

The Internal Rate of Return (IRR) for the project is estimated to be approximately 11.2%, which represents the rate at which the Net Present Value becomes zero. This indicates that the project is capable of generating an annual return of about 11.2% on the invested capital. Since the IRR is slightly higher than the assumed discount rate (10%), it reflects that the project yields returns above the minimum required rate. Therefore, the project is financially acceptable and considered a viable investment option.

Benefit Cost Ratio

Table 6: The present value of benefit at 10%

Year	Income	Discount factor	Present value
1	10,00,000	0.91	9,10,000
2	12,00,000	0.83	9,96,000
3	14,00,000	0.75	10,50,000
4	16,00,000	0.68	10,88,000
5	18,00,000	0.62	11,16,000
		Total	51,60,000

Present value cost (initial investment) = Rs 51,60,000
BCR= 1,60,000/50,00,000 BCR = 1.02

The Benefit-Cost Ratio (BCR) of the project is calculated to be 1.02, which is greater than one. This implies that for every rupee invested, the project generates a return of ₹1.02, indicating a marginal but positive gain. A BCR greater than unity signifies that the benefits outweigh the costs, confirming the economic feasibility of the project. Hence, the project can be accepted as it is expected to generate net positive returns.

4. Conclusion

The present study demonstrates that the organic herbal shampoo enterprise is technically feasible and aligns well with the growing demand for natural and eco-friendly personal care products. The formulation using medicinal plant ingredients such as neem, aloe vera, hibiscus, brahmi, and bhringraj provides an effective and safe alternative to synthetic shampoos, while also supporting sustainable and health-conscious consumer preferences.

Furthermore, the analysis of the business environment through SWOT and PESTLE frameworks highlights strong market potential driven by increasing consumer awareness, supportive policies, and expanding distribution channels. Despite certain challenges such as competition and regulatory requirements, the enterprise offers significant opportunities for agro-based value addition, employment generation, and scalable growth, making it a promising and sustainable agribusiness venture

From an economic standpoint, the enterprise is found to be financially viable, as indicated by favorable investment indicators including a positive Net Present Value, satisfactory Internal Rate of Return, Benefit–Cost Ratio greater than one, and a payback period of 3.6 years. These results confirm the profitability and efficient capital recovery of the business, further supported by the use of locally available raw materials which enhance cost-effectiveness and long-term sustainability.

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