

# Sun-Dried Prawns: Reviving a Traditional Method into a Modern Sustainable Business Model

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## ABSTRACT

Sun-drying of prawns is one of the oldest and most sustainable methods of seafood preservation, widely practiced by traditional fishing communities for centuries. In recent years, this low-cost, energy efficient technique has gained renewed attention as a potential eco-friendly business model, particularly in regions where modern cold-chain infrastructure is limited. The present study examines the biochemical and nutritional transformations that occur during the sun-drying process, while also assessing its technical feasibility, environmental benefits, and market potential. Findings suggest that sun-drying not only preserves the shelf life of prawns but also maintains a considerable proportion of their nutritional value, making them suitable for both domestic consumption and export markets. Moreover, integrating traditional drying practices with modern innovations such as hygienic handling, improved drying racks, and packaging can significantly enhance product quality and commercial appeal. Thus, the revival and modernization of this indigenous practice may serve as a sustainable pathway for entrepreneurial ventures in coastal economies, linking cultural heritage with contemporary food security and livelihood opportunities.

## INTRODUCTION

The seafood sector plays a crucial role in both global nutrition and trade, with prawns ranking among the most popular and commercially valuable aquatic products. Despite their wide acceptance, prawns are extremely perishable, which makes timely preservation necessary to avoid post-harvest losses. For centuries, coastal communities have relied on sun-drying as a practical and inexpensive way to extend the shelf life of prawns. By using the natural heat of the sun to remove moisture, this method reduces microbial activity and spoilage, allowing prawns to be stored and transported for long periods without refrigeration or chemicals.

Over time, the introduction of freezing, canning, and chemical preservatives has transformed the seafood processing industry. While these methods provide efficiency and large-scale output, they also come with significant economic and environmental costs, including high energy consumption, dependence on cold chain systems, and the growing problem of packaging waste. Against this background, sun-drying stands out once again as a low-cost and eco-friendly alternative. In addition, with increasing global interest in organic, traditional, and additive-free foods, there is renewed scope for positioning sun-dried prawns as a premium product in both domestic and export markets.

The practice of sun-drying also carries social and cultural weight, especially within coastal communities where it has long been tied to livelihoods and traditions. Women, in particular, play a central role in small-scale seafood processing and could benefit from the revival and commercialization of this practice. With recent improvements in hygienic handling, solar tunnel drying technology, and packaging innovations, sun-dried prawns can now be produced to meet modern food safety standards and consumer expectations. This creates an opportunity not only for sustainable business ventures but also for rural empowerment and preservation of traditional knowledge.

This study therefore examines the potential of sun-dried prawns as a sustainable business model by addressing biological, economic, and social aspects. It explores the biochemical changes that occur during drying,

evaluates market possibilities, and considers how traditional practices can be combined with modern techniques to achieve environmental and economic sustainability.

## MATERIALS AND METHODS

The process of preparing sun-dried prawns begins with the careful selection of raw material. Only fresh, healthy prawns are suitable for producing high-quality dried products, since spoilage at the initial stage can compromise both safety and market value. Among the species most commonly used are *Penaeus indicus* (Indian prawn) and *Penaeus monodon* (giant tiger prawn), as they have a relatively firm muscle structure and good consumer acceptance. Immediately after harvest, prawns are washed thoroughly in clean water to remove adhering sand, slime, and surface contaminants.

In some regions, a brief brining step is carried out where the prawns are soaked in a 2–3% salt solution. This not only improves flavour but also reduces surface microbial load and enhances the drying process by drawing out excess moisture. Once cleaned and optionally brined, the prawns are spread evenly on drying surfaces such as bamboo mats, plastic mesh trays, or elevated racks. Elevating the trays is important to minimize contact with dirt and ground moisture, while protective netting helps keep away flies and birds.

Drying performance depends heavily on environmental conditions. The most suitable range is between 28–40°C with relative humidity below 60%. Under such conditions, prawns require 24 to 72 hours of drying time, depending on size and thickness. Turning the prawns periodically, usually every few hours, ensures more uniform drying and reduces the risk of mould growth. Traditionally, the degree of dryness is judged through sensory cues such as texture and colour, although portable moisture meters or laboratory-based oven drying methods provide more accurate measurements. For good shelf stability, a final moisture content of 15–20% is considered ideal.

Once dried, the prawns are cooled to room temperature and immediately packed to avoid reabsorption of atmospheric moisture. Packaging in airtight polyethylene bags, vacuum pouches, or moisture-resistant containers extends shelf life and improves presentation. Labelling with harvest dates, batch numbers, weights, and relevant certifications is important, particularly for prawns intended for export markets.

## RESULT

### Traditional versus Modern Drying Techniques

Sun-drying is one of the oldest and most widely practiced food preservation methods, particularly in coastal areas. Traditionally, prawns are spread directly under the sun on mats or raised platforms, relying entirely on natural sunlight and air circulation to reduce moisture. While this method is affordable and energy-efficient, it is also highly dependent on weather conditions and can result in uneven drying. Moreover, exposure to dust, pests, and microbial contamination remains a major drawback.

To overcome these challenges, a number of improved techniques have been introduced. One widely adopted method is the solar tunnel dryer, which uses transparent covers to trap solar heat and maintain a warmer, more controlled environment. Airflow can be regulated through vents, which helps maintain uniform drying and reduces fungal growth. These systems also allow for drying in areas where sunlight intensity is lower, making them useful for year-round production. On a larger scale, hybrid systems combining solar energy with auxiliary heating (such as gas or electricity) provide even greater control over temperature and humidity.

Despite these advances, traditional open-air drying is still common in rural communities due to its low cost and simplicity. Many producers also value the cultural significance and artisanal character of sundrying, which appeals to consumers seeking traditional, natural products. In practice, a hybrid approach—where traditional practices are combined with modern improvements such as raised racks, solar covers, and better packaging—offers the most practical path forward.

## Biochemical Changes During Drying

Sun-drying of prawns results in a number of biochemical changes that influence both quality and nutritional value. The most critical effect is the reduction in water content. As moisture evaporates, water activity decreases, making the product less prone to microbial spoilage and enzymatic degradation. This directly contributes to longer shelf life.

Proteins in the prawn muscle undergo partial denaturation due to heat exposure. While this alters texture, it does not lead to major loss of essential amino acids, and in fact can improve digestibility. Lipid oxidation is another significant change. Mild oxidation contributes positively to flavour by creating characteristic dried prawn aromas, but if excessive, it can result in rancidity. The extent of lipid changes depends largely on drying conditions—higher temperatures and prolonged exposure tend to increase oxidation.

Mineral elements such as calcium, phosphorus, and iron remain relatively unaffected by drying, which means dried prawns continue to be a rich source of essential micronutrients. However, some water-soluble vitamins, particularly vitamin C and certain B vitamins, may be lost when prawns are exposed to sunlight for extended periods. These losses, though measurable, are not substantial enough to outweigh the nutritional benefits of dried prawns overall.

Careful control of drying parameters especially temperature, humidity, and drying duration—is therefore necessary to maintain both safety and nutritional quality. Optimizing these conditions helps ensure that dried prawns retain their characteristic flavour while meeting modern consumer expectations for both taste and health.

## Nutritional Profile of Sun-Dried Prawns

Sun-dried prawns represent a dense and highly nutritious source of protein, minerals, and beneficial fats, making them a valuable component of the human diet. As the drying process removes much of the water content, proteins become more concentrated than in fresh prawns. A standard portion of sun-dried prawns supplies complete proteins containing all essential amino acids, which are crucial for growth, repair, and overall metabolic health. This characteristic is particularly important in regions where access to affordable animal protein is limited. Fat levels in dried prawns remain relatively low, and the majority of lipids are unsaturated, supporting cardiovascular health and aligning with nutritional recommendations for heart-friendly diets.

Mineral retention during drying is generally high, and sun-dried prawns provide substantial amounts of calcium, iron, phosphorus, and zinc. These nutrients play essential physiological roles: calcium and phosphorus contribute to bone and dental health, iron is required for haemoglobin synthesis and oxygen transport, and zinc supports immune function and cellular repair. The preservation of these minerals throughout the drying process enhances the dietary importance of dried prawns, particularly in coastal or rural communities where access to dairy products or fortified foods may be limited.

Beyond their nutritional qualities, sun-dried prawns are prized for their strong umami flavour. The natural concentration of taste compounds during drying produces a savoury, aromatic product that features prominently in many Asian, African, and coastal cuisines. Their versatility in soups, curries, stews, and snacks adds to their commercial value. In addition, dried prawns are free from synthetic additives and preservatives, which makes them appealing to health-conscious consumers seeking “clean label” foods. Their long shelf life and compact storage requirements further strengthen their appeal in both domestic and export markets.

## Market Analysis and Business Feasibility

The global seafood market has expanded steadily over the past two decades, with dried seafood products gaining renewed attention due to their convenience, durability, and natural preservation. Reports from trade associations such as the Seafood Exporters Association of India (2022) note consistent growth in the dried prawn segment, particularly within export-driven economies. Consumer demand is strongest in regions such as

East Asia, Europe, and North America, where interest in traditional and naturally processed foods continues to rise. Health-conscious buyers increasingly associate artisanal drying practices with authenticity and sustainability, making sun-dried prawns an attractive alternative to frozen or canned seafood.

The demand for dried prawns spans multiple market segments. For households, they provide a convenient cooking ingredient with long shelf life. Within the food industry, they are incorporated into ready-made sauces, soups, and seasoning blends, particularly in cuisines where dried seafood forms a cultural staple. Restaurants and hospitality services, including gourmet and ethnic dining establishments, also use premium-grade dried prawns to add depth of flavour to signature dishes. Their unique taste profile enables chefs and food producers to differentiate products in competitive markets.

One of the economic advantages of sun-drying lies in its relatively low production costs. Unlike freezing or canning, which require substantial investments in infrastructure, energy, and logistics, sun-drying relies primarily on solar energy and simple labour. This makes it an accessible enterprise for small- and medium-sized producers, particularly in coastal regions with abundant sunlight. From a marketing perspective, positioning dried prawns as both traditional and sustainable can enhance brand identity. Emphasizing artisanal methods, ecological benefits, and nutritional value resonates strongly with ecoconscious consumers and supports premium pricing in niche markets.

### **Environmental Impact and Sustainability**

Sun-drying is often cited as one of the most environmentally friendly seafood preservation methods because it requires little to no external energy input. Unlike industrial processes such as freezing and canning, which rely heavily on electricity, fuel, and refrigeration, sun-drying relies entirely on renewable solar energy. This translates into a significantly smaller carbon footprint, aligning with global efforts to reduce greenhouse gas emissions in food production. For small-scale coastal producers, the use of solar tunnel dryers enhances efficiency by concentrating solar heat, shortening drying times, and providing protection from pests and dust, while still remaining energy neutral.

The environmental advantages of sun-dried prawns extend beyond the drying process itself. Lightweight dried prawns require minimal packaging compared to frozen products, which depend on bulky, plastic-heavy cold chain systems. Packaging innovations, such as biodegradable pouches or recycled paper-based solutions, further reduce ecological impacts. Waste generation is also minimal, with discarded prawn shells often repurposed as fertilizer, livestock feed, or as a raw material for extracting chitin, which has high-value applications in agriculture, medicine, and biotechnology. This circular approach strengthens the sustainability credentials of the industry while generating secondary income streams.

### **Challenges and Solutions**

Despite its potential, large-scale sun-dried prawn production faces challenges. A major limitation is the reliance on favourable weather. Extended periods of rain or high humidity can delay drying, cause uneven dehydration, and increase risks of microbial contamination. To overcome these constraints, investment in solar tunnel dryers or hybrid drying systems that combine solar with auxiliary heating provides more reliable and consistent results. These technologies maintain stable conditions, improve product safety, and extend drying seasons beyond peak summer months.

Food safety is another concern, as traditional open-air drying leaves prawns vulnerable to bacterial, fungal, or insect contamination. Addressing this requires strict adherence to good manufacturing practices, including clean drying surfaces, elevated racks, protective coverings, and safe handling procedures. Certification schemes such as Hazard Analysis and Critical Control Points (HACCP) can further ensure compliance with international food safety standards, making products more acceptable in export markets.

Scaling production to meet rising global demand also presents difficulties for small enterprises. Expanding drying facilities, improving packaging, and managing distribution logistics require capital investment and

training. Collaboration with cooperatives, government schemes, and private investors can help overcome these barriers by pooling resources and sharing infrastructure.

## CONCLUSION

The sun-drying of prawns demonstrates how a traditional preservation method can be adapted into a viable modern enterprise. By relying on renewable energy, maintaining nutritional integrity, and producing strong flavour characteristics, sun-dried prawns offer a sustainable alternative to energy intensive preservation techniques. With growing consumer interest in minimally processed and ecofriendly foods, the market outlook for sun-dried prawns remains promising, both domestically and internationally.

For producers, the low entry cost and cultural significance of sun-drying present an opportunity to build livelihoods while aligning with global sustainability trends. Innovations such as solar tunnel dryers and hybrid systems address critical challenges like weather dependency and contamination, enabling greater consistency and quality. By integrating traditional knowledge with modern food safety standards and effective branding strategies, sun-dried prawns can successfully compete in premium markets.

## Future Prospects

Looking forward, the future of sun-dried prawns appears strong, driven by both consumer preferences and technological innovation. The shift toward sustainable and ethically sourced proteins provides an opening for dried prawns to establish themselves as a reliable, natural food source. Increasingly, consumers also value traceability and provenance in their foods, offering opportunities for producers to highlight local, artisanal methods and community-based production systems.

Technological improvements will continue to play an important role. More advanced solar dryers with enhanced energy efficiency and controlled conditions will help standardize quality while reducing risks of spoilage. Packaging research into biodegradable or recyclable materials will further strengthen environmental credentials. Moreover, the valorisation of by-products such as prawn shells into chitin and other derivatives adds an additional layer of economic and ecological value.

Collaboration between academic researchers, government agencies, and the private sector will be vital in driving innovation, supporting training, and expanding access to international markets. For coastal communities, especially in developing regions, sun-dried prawns represent not only a source of income but also a way to preserve cultural identity. As consumer demand for sustainable and flavour-rich foods continues to grow, the sector is well-positioned to thrive in the decades ahead.

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