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**Nirupama Mahato**

Agricultural Economics,

Greenfield College of

Agriculture, Indore, Madhya

Pradesh, India

# Market potential and entrepreneurial opportunities of underutilized fruits: A case of Karonda in rural trade networks

**Nirupama Mahato**

## Abstract

Underutilized fruit crops hold immense potential in addressing the challenges of rural livelihoods, nutritional security, and sustainable entrepreneurship in India. Among these, Karonda (*Carissa carandas*), a hardy, indigenous, and nutritionally rich fruit, remains largely neglected despite its wide adaptability and traditional usage in food and medicine. This paper explores the market potential and entrepreneurial opportunities associated with Karonda within rural trade networks, drawing upon horticultural production data, case studies, and government initiatives promoting agri-entrepreneurship. Using secondary data from the Horticulture Statistics Division of the Ministry of Agriculture and Farmers' Welfare, ICAR research reports, and state-level horticultural missions, the analysis demonstrates that Karonda can emerge as a viable economic asset by integrating value addition, cooperative marketing, and supply chain innovations. The findings highlight how Karonda-based products such as pickles, squashes, jams, and nutraceutical formulations have growing domestic and export markets. Moreover, its hardy nature and low input requirements make it suitable for smallholders in semi-arid and resource-constrained rural economies. The discussion critically evaluates constraints such as lack of organized markets, poor awareness of processing techniques, and weak extension linkages. The paper concludes that integrating Karonda into rural trade networks through entrepreneurship models, farmer producer organizations (FPOs), and support from horticultural policies can enhance both income and employment opportunities in rural India.

**Keywords:** Karonda, underutilized fruits, rural entrepreneurship, market potential, value addition, farmer producer organizations, horticultural policies, agri-business, nutritional security

## Introduction

India's horticultural diversity is one of its greatest assets, with more than 50 fruit crops cultivated commercially and over 100 minor and underutilized fruits spread across different agroecological zones. Despite this richness, the horticultural market has historically been dominated by a few major fruits such as mango, banana, guava, apple, and citrus. Underutilized fruits, often relegated to backyard or wild collection, have received little policy attention or market integration. Karonda (*Carissa carandas*), a hardy fruit-bearing shrub native to India and South Asia, is a representative example. Though long used in traditional households for pickles, chutneys, and medicinal remedies, it has not yet been mainstreamed into India's agricultural economy.

Karonda belongs to the Apocynaceae family and is known for its high content of vitamin C, iron, and antioxidants. Its fruits, leaves, and roots are used in ethnomedicine, while its hardy nature makes it suitable for marginal lands. The crop grows naturally in semi-arid zones of Uttar Pradesh, Madhya Pradesh, Rajasthan, Maharashtra, and the Deccan plateau, often serving as live fencing or boundary plantation. According to the Horticulture Statistics Division (Government of India, 2022), India's production of underutilized fruits like ber, jamun, phalsa, and karonda together accounts for less than 2 percent of the total fruit production, yet they contribute significantly to rural diets and supplementary incomes. Karonda, though not recorded as a major crop in official data, has scattered production pockets, particularly in Uttar Pradesh and Maharashtra, where it has been integrated into local markets through small traders and women entrepreneurs.

The problem lies not in Karonda's suitability but in its neglect by formal horticultural policies and trade systems. In most rural economies, the fruit is either consumed locally or sold in unorganized village markets, fetching low returns. Post-harvest losses remain high due to its perishable nature, and processing units are concentrated only in select clusters. For

**Corresponding Author:**

**Nirupama Mahato**

Agricultural Economics,

Greenfield College of

Agriculture, Indore, Madhya

Pradesh, India

rural India, where diversification of livelihoods and value addition are crucial to reduce dependence on cereals and improve incomes, such neglect represents a missed opportunity. Furthermore, the global demand for functional foods, natural antioxidants, and nutraceutical products has been expanding rapidly. Karonda's bioactive composition makes it a potential raw material for such industries. This creates scope for integrating traditional knowledge with modern entrepreneurial strategies.

This paper seeks to bridge the gap by analyzing the market potential and entrepreneurial opportunities of Karonda, using rural trade networks as the central focus. The objectives are to examine Karonda's nutritional, ecological, and economic relevance; assess its current production and utilization status; evaluate market opportunities for value-added products; and identify entrepreneurial pathways to integrate Karonda into rural trade. The hypothesis guiding this study is that underutilized fruits like Karonda, when supported by institutional frameworks, value addition, and rural entrepreneurship models, can emerge as commercially significant crops contributing to both livelihood security and nutritional well-being.

### **Karonda: Botanical, Nutritional, and Socioeconomic Context**

Karonda is a spiny, evergreen shrub, typically growing up to 2-3 meters, bearing small berry-like fruits. It is drought-tolerant, thrives in poor soils, and requires minimal care, making it suitable for marginal lands. Nutritionally, fresh Karonda fruits contain about 30-40 mg of vitamin C per 100 g, iron content ranging from 30-39 mg per 100 g, along with anthocyanins and phenolic compounds that contribute to antioxidant activity. Its calorific value is modest, but its micronutrient richness makes it valuable in combating iron-deficiency anemia and vitamin C deficiencies in rural diets. Ethnomedicinal literature documents its use as an antipyretic, cardi tonic, and digestive.

Socioeconomically, Karonda has remained a "poor man's fruit," often collected from wild shrubs or home gardens. Women play a significant role in harvesting and processing Karonda into chutneys and pickles for household consumption or local sale. In Bundelkhand, for instance, Karonda pickles are sold in weekly village haats, while in Maharashtra, small cooperatives market Karonda squash and syrups. Despite this, there is no organized value chain or branding strategy for Karonda, unlike mango (with Alphonso or Dasheri branding) or banana (with Cavendish export systems).

### **Production and Supply Trends in India**

Karonda production in India has never been part of the mainstream horticulture statistics, largely because it is considered a minor or underutilized crop. Yet scattered reports from the Horticulture Statistics Division, National Horticultural Board, and ICAR institutes reveal its modest but steady presence. In Uttar Pradesh, particularly in Bundelkhand and Varanasi districts, Karonda shrubs are cultivated in small orchards or along bunds of fields. Maharashtra's Satara and Pune districts have recorded organized orchards where Karonda is cultivated as part of mixed cropping systems. According to estimates compiled in the Horticultural Statistics at a Glance 2021, the area under "minor fruits" (a category including Karonda, ber, phalsa, jamun) is nearly 200,000 hectares, producing over

1.2 million tonnes annually. While the share of Karonda alone is not disaggregated, regional studies suggest it accounts for 10-15 percent of this minor fruit output.

The advantage of Karonda cultivation lies in its adaptability to resource-poor conditions. It requires little irrigation, can tolerate salinity, and survives prolonged dry spells. Farmers in Rajasthan and Madhya Pradesh have historically planted Karonda as a fencing crop because of its thorny branches. More recently, horticultural missions have begun recognizing its potential. Under the National Horticulture Mission (NHM), Karonda plantations have been supported in some states as a component of arid horticulture. For example, the Madhya Pradesh Horticulture Department reported in its 2020-21 annual plan that nearly 1,200 hectares of Karonda plantations were established under subsidy support.

Despite its natural abundance, Karonda suffers from weak supply chains. Fruits are sold mostly in village markets at low prices, ranging between ₹20-40 per kg in peak season. Unlike mango or pomegranate, there is little aggregation, grading, or cold storage infrastructure. Post-harvest losses can reach up to 25-30 percent, especially when fruits are not processed immediately. The absence of farmer producer organizations (FPOs) or cooperatives dedicated to underutilized fruits means that most farmers cannot leverage economies of scale. This situation highlights the gap between production potential and market realization, a gap that entrepreneurship can fill.

### **Market Potential and Value Addition**

The demand for Karonda and its processed products is rising in domestic and niche international markets. Traditionally, households used Karonda to prepare pickles, chutneys, and curries, but over the last decade, food entrepreneurs have experimented with squashes, jams, syrups, dehydrated powders, and even nutraceutical capsules derived from its extracts. According to a survey conducted by the Indian Institute of Horticultural Research (IIHR, Bengaluru) in 2019, value-added Karonda products demonstrated shelf lives of 6-12 months, opening avenues for commercialization.

In India's processed food industry, the market for pickles and chutneys alone is worth over ₹1,500 crore (ASSOCHAM 2021). Karonda can easily be integrated into this segment. Entrepreneurs in Uttar Pradesh's Chitrakoot district have already begun marketing Karonda pickles under local brands, selling through fairs and online platforms. Similarly, a women's self-help group in Maharashtra, supported by NABARD, processes Karonda into squash and has successfully linked its products to urban markets in Pune and Mumbai.

Internationally, there is demand for indigenous, antioxidant-rich fruits in nutraceutical and herbal supplement markets. Karonda's documented phytochemicals—flavonoids, anthocyanins, and vitamin C—make it suitable for functional food development. The global nutraceutical market, valued at over USD 400 billion in 2022 (Statista 2023) <sup>[16]</sup>, is increasingly sourcing raw materials from underutilized fruits. India, with its biodiversity, can carve a niche if crops like Karonda are branded effectively. Export potential remains largely untapped but is visible in the interest shown by diaspora communities and herbal product companies.

Value addition also ensures income stability for farmers.

Fresh Karonda prices fluctuate heavily depending on seasonality, but processed products fetch 3-4 times higher returns. A kilogram of fresh fruit, worth ₹30 in local markets, can be processed into pickle jars retailing for ₹150-200. This multiplication of value is central to the entrepreneurial argument for Karonda.

### Entrepreneurial Opportunities in Rural Trade Networks

Rural trade networks in India are undergoing transformation due to the spread of self-help groups, farmer producer organizations, and digital platforms. Underutilized crops like Karonda fit well within these emerging entrepreneurial ecosystems. Several models of entrepreneurship can be developed around Karonda:

- **Women-led microenterprises:** Karonda processing is already familiar to rural women. With training in packaging, hygiene, and branding, self-help groups can convert this knowledge into commercial ventures. This model has succeeded in districts like Satara, where SHGs have sold Karonda squash under state horticulture branding.
- **FPO-based aggregation:** Farmer producer organizations can aggregate Karonda fruits from scattered growers, establish small processing units, and market under collective brands. The FPO model also enables bargaining with wholesalers and retailers, reducing exploitation by middlemen.
- **Agri-startups and e-commerce:** Young entrepreneurs can develop Karonda-based health products—juices, capsules, powders—and sell them via online platforms. With the government promoting Start-up India and PM-FME (Formalisation of Micro Food Enterprises) schemes, financial and technical support is available for such ventures.
- **Linkage with rural tourism:** In regions with ecotourism or cultural tourism, Karonda products can be marketed as local specialties. Bundelkhand and Rajasthan already showcase millets in this manner; Karonda could join as a “signature” fruit product.

Such opportunities illustrate how Karonda can integrate into rural trade networks not only as a crop but as a driver of localized value chains. By combining traditional knowledge with modern entrepreneurship, Karonda can transform from a neglected fruit into a marketable commodity.

### Constraints and Challenges in Utilization

Despite its promise, Karonda faces several barriers to wider utilization. The first challenge is lack of awareness among consumers and policymakers. Unlike mango or guava, Karonda has no nationwide branding, which limits its visibility. The second challenge is post-harvest handling. Fruits are small, perishable, and prone to microbial spoilage. Without cold chains or processing within 48 hours, losses remain high.

Another major limitation is the absence of organized markets. Most Agricultural Produce Market Committees (APMCs) do not even list Karonda as a traded commodity, which prevents farmers from accessing transparent price discovery. Processing technologies, though developed by ICAR-CFTRI and other institutes, are not widely disseminated. Packaging remains rudimentary, and quality standards are rarely enforced.

Financial barriers also hinder entrepreneurship.

Microenterprises in rural areas often lack collateral for loans and have limited access to schemes like PM-FME or MUDRA loans. Moreover, intellectual property and branding issues prevent local entrepreneurs from scaling up. A broader challenge lies in the perception bias—Karonda is still considered a “poor man’s fruit,” which discourages urban consumers from adopting it despite its health benefits.

### Policy Support and Institutional Framework

Government schemes in India provide a strong base for integrating underutilized fruits like Karonda into formal markets. The National Horticulture Mission (NHM) promotes plantation of minor fruits in arid and semi-arid regions. The Mission for Integrated Development of Horticulture (MIDH) has provisions for establishing nurseries, providing planting material, and supporting value addition. State horticulture departments in Uttar Pradesh, Madhya Pradesh, and Maharashtra have introduced Karonda in subsidized plantation programs.

The PM-FME Scheme (2020) specifically targets micro food enterprises by offering 35 percent credit-linked subsidy for upgrading processing units. Karonda entrepreneurs can leverage this support to establish small-scale pickle or squash units. Similarly, NABARD’s Rural Innovation Fund has supported SHGs working on Karonda products.

Institutional research is also expanding. ICAR-CISH (Central Institute for Subtropical Horticulture, Lucknow) has developed improved varieties such as ‘Pant Manohar’ and ‘Pant Sudarshan,’ which have better fruit size and yield. Dissemination of such varieties can enhance farmer adoption. International organizations like FAO emphasize the role of underutilized fruits in nutritional security, which strengthens the case for policy integration.

### Conclusion

The case of Karonda illustrates the untapped potential of underutilized fruits in strengthening rural trade networks and entrepreneurial landscapes in India. Nutritionally rich, ecologically resilient, and culturally embedded, Karonda offers multiple pathways for value addition and income diversification. With growing consumer demand for natural, functional foods, Karonda can be transformed from a neglected crop into a marketable commodity.

Realizing this potential requires coordinated action. Farmers need access to improved planting material and processing technologies. Entrepreneurs need financial support, branding strategies, and market linkages. Policymakers must integrate underutilized fruits into horticultural missions, while researchers must continue developing value-added products and documenting health benefits. If these elements converge, Karonda can become a significant asset in rural economies, offering both nutritional and livelihood security.

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