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HARNESSING *Moringa oleifera* THROUGH INNOVATION: A PATHWAY TO ECONOMIC GROWTH

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Moringa oleifera Lam., sometimes known as the drumstick or ben oil tree, miracle tree, is an extensively cultivated member of the *Moringaceae* family, also a fast-growing, drought-resistant plant. It is commonly grown in India, the Philippines, tropical Asia, Latin America, the Caribbean, and the Pacific Islands (Saini et al., 2012). This fast-growing tropical perennial soft-wooded tree has a long history of medicinal and culinary use. It thrives in tropical and subtropical climates and requires between 250 and 2000 mm of rainfall, depending on soil conditions (Azad et al., 2015). *Moringa oleifera* is a deciduous, perennial tree that may reach a height of 10-12 meters. The younger roots are tuberous, whereas the older roots are branching. The stems are spreading and fragile, while the bark is silvery grey with a rough texture. The leaves are tripinnately compound, up to 45 cm in length, with 4 - 6 leaflets in pairs measuring 2.0 - 2.8 × 0.9 - 1.8 cm, ovate, upper side dark green, lower side light

green, pedicel 0.3 - 0.7 cm in length (Singh et al., 2020).

Culinary, medicinal and nutritional value

Moringa oleifera is a versatile food condiment, with its pods, leaves, seeds, flowers and roots widely used in cooking. The young, cooked pods are pleasant, fiber-free, and eaten like green beans. The leaves can be consumed as greens, cooked, fried, or used in soups and stews. The seeds can be cooked or fried, like peas, and

roasted like peanuts. Dried roots and seeds serve as seasoning, while flowers are brewed as tea. Resin from the tree trunk may be used to thicken sauces (Hossain et al., 2022).

Moringa oleifera may also be used in other bakery items, while not as common in daily meals, it is extensively enjoyed by people of all ages and cultures. Flour from seed and dry *Moringa* leaf powder are widely used to strengthen wheat or other flour-based bread dough. Several studies have examined how adding *Moringa* affects beef product qualities. *Moringa* is used in meat products such as sausages, nuggets, minced meat, and mortadella with raw material to inhibit lipid oxidation and provide antioxidant and antimicrobial effects during storage (Trigo et al., 2023).

Supplementing *M. oleifera* powder in cereal porridge has been proven to increase vitamin A content by up to 15 times.



Image 1: *Moringa oleifera* culture (Source: Author's own collection)



Image 2: *Moringa oleifera* products (Source: mymoringamall website: <https://mymoringamall.com/>)

The protein content of the white maize variety increased by 94% when fortified with 15% *Moringa oleifera* powder (Milla et al., 2021). These present commercial potential for functional food markets.

Moringa oleifera offers a powerful combination of nutritional and medicinal benefits. Its leaves are rich in protein, β -carotene, amino acids, phenolic substances, vitamins A, C, and E, minerals (calcium, iron, and potassium), and bioactive substances, including flavonoids and phenolics (Prajapati et al., 2022). Because of these qualities, it is a useful dietary supplement, particularly in areas where malnutrition is prevalent (Sarwar et al., 2020). The high protein content of the *M. oleifera* leaves and pods makes them very interesting; eating these plant parts can help prevent malnutrition at a minimal cost.

It has been discovered that the *M. oleifera* plant contains, and Pterygospermina, an antibiotic compound that was taken from the bark and flowers of *M. oleifera* plants, had strong antibacterial and antifungal properties. *Moringa oleifera* has been used in traditional medicine for the treatment of several ailments and, more recently, has been proposed to be beneficial in multiple disorders, including cardiovascular, diabetic, cancer, neurological, gastroenterological, and inflammatory (Vargas-Sánchez et al., 2019).

The global demand for *Moringa* products – including raw and processed pods, leaves and seeds – continue to grow, reflecting its economic value as both a health supplement and medicinal plant (Bukar & Abba, 2022).

A pathway to economic growth

Moringa oleifera is emerging as a strategic bioresource with significant potential to drive economic growth through research and development (R&D) innovation. While traditionally valued for its nutritional and therapeutic benefits, recent scientific advancements have revealed its wide-ranging industrial applications. The seeds of *Moringa oleifera* yield ben oil, a high-quality extract used in the production of biodiesel, pharmaceuticals and cosmetics – industries that contribute directly to job creation, export potential and sustainable

economic activity (Abdel et al., 2023). Furthermore, the by-product of oil extraction, known as seed cake, has been scientifically validated as a natural and eco-friendly coagulant for water purification, providing a low-cost, sustainable solution for clean water access in both rural and urban communities (Abdel et al., 2023). The presence of bioactive phytochemical compounds in *Moringa* extracts contribute to its antibacterial and antifungal properties, further expanding its potential for pharmaceutical and public health innovations.

As water scarcity becomes a growing global challenge – driven by population growth, industrialization, and environmental degradation – *Moringa oleifera* offers an R&D driven response through its proven effectiveness in wastewater treatment. Research indicates that the bark of *Moringa* can remove heavy metals and methylene



Image 3: *Moringa oleifera* capsule products (Source: organicveda, website: <https://www.organicveda.my/>)

blue from contaminates water sources, providing a cost-effective and scalable solution to environmental clean-up efforts (Azad, 2020).

Beyond industrial and environmental applications, consumer-oriented innovations are also advancing. Companies such as MR Moringa and Organic Veda are leveraging R&D to deliver 100% organic Moringa oleifera leaf powder tailored for modern health-conscious markets. These products are rich in vitamins C and A, iron, calcium, magnesium, protein and chlorophyll, making them ideal for nutritional supplementation. The bioactive compounds in

Moringa, such as zeatin, contribute to numerous health benefits, including enhanced immunity, energy, skin health and anti-aging effects. These properties open up new avenues for R&D investment in functional foods, nutraceuticals and cosmeceuticals, all of which are fast-growing global markets with strong economic potential.

By investing in innovative R&D across agriculture, healthcare, clean technology and consumer wellness, Moringa oleifera stands as a model of how local biodiversity can be transformed into high-value economic drivers on the national and global stage.

References

