

## International Journal of Agriculture Extension and Social Development

Volume 9; Issue 9; September 2026; Page No. 482-484

Received: 03-07-2026  
Accepted: 05-08-2026

Indexed Journal  
Peer Reviewed Journal

### Geranium farming: A profitable aromatic crop for sustainable rural livelihoods

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DOI: <https://www.doi.org/10.33545/26180723.2026.v9.i9g.4225>

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#### Abstract

Geranium farming is a highly profitable, low-maintenance, and aromatic crop suitable for various climates, offering high returns through essential oil extraction from leaves, stems, and flowers. Thriving in well-drained soil with a pH of 6.0-7.5, it is propagated via stem cuttings and harvested within a year. Due to their substantial antibacterial and anti-fungal activity, geranium essential oils and its extracts can be used as effective novel food and cosmetic industries. Geranium oil cultivation offers farmers a sustainable, high-value crop with consistent profitability over multiple years. Ecologically, hardy geraniums act as groundcovers, preventing soil erosion on slopes and supporting pollinators in fragile Himalayan landscapes. Culturally, geraniums are prized as ornamental plants. In addition to this, rising demand in aromatherapy, perfumery, and natural cosmetics and expanding retail and wellness sectors creating a strong demand for geranium oil production. Further, geraniums combine economic value, ecological resilience, and social impact, making them a cornerstone of sustainable livelihoods in Uttarakhand.

**Keywords:** geranium oil, cost benefit analysis, perfumes, anti bacterial

#### Introduction

Medicinal and aromatic crops play a pivotal role in the socio-cultural, economic, spiritual and health dimensions of India's rural population and have become an integral part of our culture and rituals. Medicinal and aromatic plants (MAPs) are garnering significant global attention due to their ability to provide a diverse array of safe and cost-effective preventive and curative therapies, contributing to the pursuit of universal health. (Bansal *et al* 2002, Demarne *et al* 2002) <sup>[1, 2]</sup>.

Scented geranium (*Pelargonium graveolens*) is an important aromatic crop belongs to the family geraniaceae. The genus *Pelargonium* contains about 270 species placed under 16 sections. Geranium is mainly cultivated for its rose scented leaves from which essential oil produced through steam distillation, its essential oil ranks among the top 20 essential oils in the global market. (Kumar *et. al.* 2013, 2001) <sup>[8, 9]</sup>. This oil has a strong rose-like odour with a minty top note. Rhodinol i.e., geranium oil has a delightfully sweet, fresh, rosy, uniform and tenacious aroma and is used extensively in perfumery (Kassahun 2012, Shawl *et al* 2006) <sup>[7, 17]</sup>. Geranium cultivation in Uttarakhand is emerging as a profitable aromatic crop, with oil prices reaching ₹10,000-₹12,000 per liter and yields of up to 163 kg oil per hectare under optimized nutrient management. Farmers in districts like Dehradun, Bageshwar, and Udham Singh Nagar are adopting it as a high-value alternative to traditional crops. Geranium essential oil has wider application like, in aromatherapy, it is used as a relaxant, a sedative for nervous tension and a treatment for

bronchitis, laryngitis, and menopausal problems. (Sharopov *et al* 2014) <sup>[16]</sup>.

The hydrosol (distillate water rich in hydrophilic fraction of oil) is sprayed on crops to combat pests and diseases (Peterson 2005) <sup>[10]</sup>. Geranium (*Pelargonium graveolens*), often referred to as the "poor man's rose" due to its rose-like fragrance, is a high-value aromatic crop that plays a significant role in enhancing rural livelihoods (Ram *et al* 2003) <sup>[12]</sup>. Cultivated primarily for its essential oil, it is a key component in the cosmetics, perfume, and aromatherapy industries, offering high profitability per hectare compared to traditional crops. Beyond skincare, geranium oil plays an important role in aromatherapy, where inhalation helps reduce stress, anxiety, and fatigue, creating a calming effect on the nervous system. It is also known to support hormonal balance, easing menopausal symptoms and menstrual discomfort when used in massage blends. Additionally, diluted geranium oil can provide pain relief for sore muscles and joints, and inhalation has been linked to lowering blood pressure and heart rate, offering cardiovascular benefits (Saxena *et al* 2008, Rao *et al* 2002, Sastry *et. al.* 2001) <sup>[13, 14, 15]</sup>.

#### Cultivation of geranium

**Adaptability:** Geranium is a perennial herb that thrives under diverse agro-climatic conditions, preferring temperate to sub-tropical climates and well-drained, acidic soil (pH 5.5-6.0). In Uttarakhand, geraniums show a good adaptability that

connects both horticultural practice and local livelihood. The pelargonium varieties, thrive well in the mid-hill regions where the climate is temperate and the soil is moderately fertile. Farmers in districts like Chamoli, Tehri, and Almora have adopted geranium cultivation because the plants tolerate sloping terrain, require relatively low maintenance. However, since pelargoniums are frost-sensitive, they need protection during harsh winters, often being rotated seasonally or grown under controlled conditions. (Gabremeskel *et al* 2014)

**Propagation & spacing:** It is propagated through stem cuttings (10-15 cm), with about 30,000-40,000 cuttings required for one hectare. (Upadhyay *et al* 2016) <sup>[19]</sup>.

**Yields and profitability:** In Uttarakhand, geranium cultivation has shown strong profitability compared to traditional crops. Under optimal nutrient management (NPK 180:160:140), farmers can achieve around 327 quintals of fresh herb per hectare, which yields approximately 163 kilograms of oil annually. With market prices ranging between ₹10,000 and ₹12,000 per liter, the gross returns per hectare can reach ₹16-19 lakh. After accounting for cultivation and distillation costs, the net profit per hectare is still significantly higher than cereals or pulses, making geranium one of the most lucrative aromatic crops in the region. The profitability is driven by the high demand for geranium oil in aromatherapy, cosmetics, and herbal medicine. (Singh *et al.* 2016)

**Value addition & distillation:** Farmers can significantly boost their income by setting up local distillation units to convert raw leaves into essential oil, a process supported by various agricultural initiatives. (Hussain *et al* 2009, Jalali 2006) <sup>[4]</sup>.

**Employment creation:** The cultivation and distillation process create employment opportunities for rural workers, including harvesting, leaf processing, and operating distillation units. The plant is naturally resistant to pests and grazing animals, reducing the need for costly, harmful pesticides, which aligns with sustainable agriculture practices. The Geranium cultivation has emerged as a significant source of employment creation in regions like Uttarakhand, where both ecological conditions and market demand align. The crop's adaptability to mid-hill climates allows farmers to diversify away from traditional cereals, opening opportunities in floriculture and the essential oil industry. Employment is generated at multiple levels:

**farm-level jobs:** Cultivation requires labor for land preparation, planting, weeding, irrigation, and harvesting. Since geranium is a perennial crop, it ensures year-round engagement for rural workers.

**Processing and distillation:** Geranium oil extraction is labor-intensive, involving biomass collection, distillation, and packaging. Cooperative distillation units in Uttarakhand have created clusters of employment, especially for women and youth.

**Value addition and marketing:** Beyond raw oil, geranium is used in perfumes, cosmetics, and aromatherapy products. Small enterprises and self-help groups engage in value-added production, creating entrepreneurial opportunities.

### Medicinal uses of geranium oil

The oil exhibits strong activity against various bacteria (including *Staphylococcus aureus*) and fungi, making it effective for topical skin infections and wound management.

It acts as a natural anti-inflammatory agent, potentially useful in reducing pain, alleviating eczema, and treating dermatitis. Used in aromatherapy, it acts as a calming agent to reduce stress, anxiety, and depression, while also showing potential in neuroprotective studies.

Another practical use is as a natural insect repellent, providing an eco-friendly alternative to chemical sprays. Its versatility extends to household applications, where it is added to natural cleaning products for its antimicrobial qualities. However, it should always be diluted before topical use, and pregnant or breastfeeding women are advised to consult a healthcare provider before using it.

In aromatherapy, inhaling geranium oil can lower stress hormones, providing relief from anxiety and depression while also supporting hormonal balance during menstruation or menopause. Additionally, it has been shown to improve circulation, lower blood pressure, and act as a mild diuretic, aiding detoxification and reducing fluid retention. Its versatility makes it a valuable natural remedy, though it should always be diluted before use and applied with caution to avoid irritation.

### Challenges

Despite its potential, challenges include high initial investment costs, the need for consistent irrigation, and the scarcity of quality planting materials. The crop is highly sensitive to moisture management excess irrigation or poorly drained soils can reduce oil quality and even damage plants. Another major hurdle is the high cost of cultivation, which includes expenses for planting material, fertilizers, labor, and especially distillation units. Without cooperative or government-supported distillation facilities, small farmers struggle to process their harvest profitably. The price of geranium oil fluctuates with global demand in the fragrance and cosmetics industry, making income unpredictable. Climatic sensitivity adds to the risk while it thrives in temperate zones, unexpected weather changes can reduce yields. Finally, pests and diseases, though less severe than in food crops, can still affect productivity if not managed properly. Government initiatives, such as the CSIR-Aroma Mission, provide farmers with quality planting materials, training, and technical support, promoting geranium as a way to increase rural incomes.

### Cultural importance

Geraniums hold rich cultural significance across various regions. In Europe, particularly in Germany and France, they symbolize friendship and loyalty, often adorning gardens and window boxes as part of a tradition to beautify homes and public spaces. In South Africa, indigenous Pelargoniums are woven into local culture, enhance local crafts and art. Artists and writers have long drawn inspiration from geraniums, associating them with domesticity and nostalgia, often conveying themes of tranquillity in still-life paintings.

Symbolically, geraniums represent love, appreciation, and comfort, with different colours signifying various meanings: red for passion, pink for friendship, and white for innocence. Their adaptability and low maintenance make them popular in gardens worldwide, where they play a role in promoting biodiversity and attracting pollinators, highlighting their ecological importance.

## Conclusion

Geranium (*Pelargonium* spp.) emerges as a valuable ornamental crop with significant economic importance, particularly in India, where its cultivation is supported by a favourable climate and increasing market demand. The adaptability of geraniums ranging from decorative landscaping plants to essential oil sources has been made them a basis of the floriculture industry. With several species, their ornamental demand is supplemented by their applications in cosmetics, aromatherapy, and traditional medicine, where high-quality geranium oil can fetch prices between ₹10,000 to ₹15,000 per kilogram. As global trends shift toward organic and sustainable products, the geranium market is projected to grow, presenting profitable opportunities for farmers and business sectors.

Furthermore, geranium cultivation adopts rural development by creating jobs and enhancing local economies. Culturally significant across various regions, geraniums not only enrich gardens but also contribute to biodiversity and ecological health. As such, they represent a promising pathway for sustainable economic growth, highlighting the need for cultivation and market development.

To conclude it can be recommended for Farmers that they should Start with small acreage (1-2 acres) to test profitability. Join cooperative distillation units to reduce processing costs. Diversify with lemongrass or chamomile to balance market risks. Leverage CSIR-CIMAP training programs for best practices in nutrient management and oil extraction.

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