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Research Article

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Loose Flowers Consumption and Wastage Management in Nepal

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Abstract

Nepal is rich in cultural heritage and natural beauty and has a deep rooted tradition of using flowers in religious, spiritual and social ceremonies. With the rapid growth of the floriculture sector- comprising over 1,170 nurseries and generating transactions worth NPR 3.68 billion in 2023/24, flower consumption has surged, especially during the festive season. However, this flourishing industry faces a growing challenge: floral waste. Unmanaged floral waste contributes to environmental degradation, including methane emissions and chemical pollution of water bodies. This research attempts to review and survey the current status of floriculture in Nepal, quantify flower waste generation, survey waste flower recycling, and highlight the innovative recycling practices. Each year, an estimated 5,000 metric tonnes of loose flowers and garlands are used in Kathmandu alone, with only 2% being recycled. Some local startups in Kathmandu have pioneered eco-friendly incense production from discarded flowers, promoting sustainability and women's empowerment. Furthermore, the study explored the future opportunities such as essential oil extraction, dye production, pigment extraction and preparation of biopesticides. With government support, especially the 2022 ban on plastic flowers, and increased public awareness, Nepal has vast potential to integrate floral waste management into a circular economy. Sustainable practices can turn floral waste into valuable resources, reduce import dependency and open new economic opportunities for rural and urban communities.

Keywords: Circular economy, Floral waste, Incense, Loose flowers, Recycling

Introduction:

Situated in the magnificent Himalayas, Nepal boasts unmatched natural beauty and a rich cultural heritage. The country's lively festivals, sacred ceremonies, and vibrant celebrations are closely linked to the gifts of nature, especially its wide variety of flowers (Anderson, 1971). These flowers are utilized to embellish temples, shrines, and residences, representing purity, devotion, and prosperity. Thus, flowers possess significant cultural and spiritual importance in Nepal. The floriculture sector is a flourishing industry in Nepal. Over the last 25 years, the volume of business has increased by many folds (FAN, 2015). In 2012, the Government of Nepal supported entrepreneurs by introducing the Floriculture Promotion Policy. Key business areas of floriculture sub-sector include seasonal flowers, cut flowers, cut foliage, ornamental plants, landscaping and garden design, flower arrangements and decorations, input supplies, and foreign trade.

Individuals present flowers and garlands to deities, enhancing religious and spiritual ceremonies, marriage celebrations, and embellishing temples, residences, offices, and event venues. Travel agencies and corporate

banks also express a preference for utilizing flowers. Garlands and bouquets are commonly employed in social gatherings to greet guests and to beautify stages and podiums. Each year, there is a peak in the demand and utilization of flowers during the festive season in Nepal, particularly the festivals like Tihar, Chhat Parwa, Dashain and Thulo Ekadashi (Prasain, 2025). Nepal has prohibited the production, sale, import, and distribution of plastic flowers, artificial garlands, and bouquets to mitigate pollution, thereby encouraging consumers to opt for real flowers. The ban was enforced on July 29, 2022 by Ministry of Forests and Environment with the notification in the Nepal Gazette (MoFE, 2022).

Nevertheless, the fleeting beauty of these flowers conceals a more persistent issue: the disposal of floral waste. What occurs to them once they have fulfilled their role? As festivals come to a close and ceremonies wrap up, vast quantities of floral waste are left behind, destined for landfills, rivers, or other aquatic environments, where they exacerbate pollution and environmental degradation (Sharma, 2024). Conversely, flower wastage in Nepal arises from oversupply, particularly during festivals such as Tihar. The excessive importation of flowers from India, especially marigolds during Tihar, frequently results in surplus, leading to the wastage of domestic flowers. Farmers incur financial losses when they are unable to sell their products even at breakeven prices. This results in substantial amounts of discarded flowers, contributing to both economic loss and environmental challenges (The Rising Nepal, 19 November 2023). Without taking local produce into account, an excessive quantity of marigold garlands was imported from India, as reported by the Floriculture Association Nepal (FAN). "Although native production was anticipated to satisfy 85 percent of festive demand, approximately 30 percent of the market requirement was imported, resulting in the loss of about 15 percent of Nepalese flower production," states a press release issued by the umbrella organization FAN (Republica, 7 November 2021).

The disposal of floral waste presents numerous environmental issues. Decomposing flowers emit methane, a powerful greenhouse gas that plays a role in climate change. Furthermore, harmful pesticides used in production of flowers seep into waterways, make unsafe for living beings and affect aquatic ecosystems. Elements such as arsenic, lead, and cadmium have the potential to pollute aquatic ecosystems, leading to harmful pH variations (ranging from 6 to 8.5), thereby intensifying the ecological consequences of inadequate floral waste management (Devi et al., 2022).

Various initiatives are emerging to convert floral waste into valuable products, thereby fostering sustainability. Organizations such as Phoolprasad and Bhoomithan in Kathmandu are repurposing floral waste into incense sticks and other items. The presence of over 3,000 temples in the Kathmandu Valley and 30,000 throughout Nepal emphasizes the longstanding tradition of incense usage. Annually, incense sticks and ropes worth more than $5 million are imported. Kathmandu's status as a city rich in temples and heritage sites highlights the cultural necessity for incense. Each year, approximately $1 million worth of incense sticks and ropes are exported (Sharma, 2025). Other innovative strategies for floral waste management are yet to be explored in Nepal. Such innovations may include use of dried flowers in cuisine as flavouring and coloring agent in food items, sweets or ice-cream, preparation of floral tea or beverages, natural cleansers and biopesticides, pigment extraction, use as dye for textiles, extraction of essential oils, preparation of artisanal soaps etc.

Floral waste can be composted to enhance soil quality and support local agriculture. By supporting local flower farmers, promoting domestic production, and encouraging sustainable farming practices, we can decrease dependence on imports and minimize waste. The implementation of effective waste management systems, which include collection, segregation, and processing, is essential for the efficient handling of floral waste. The recycling of floral waste minimizes landfill waste, conserves resources, fosters sustainability, and generates economic opportunities. By recycling floral waste, we prevent it from entering landfills, thereby decreasing the volume of waste that accumulates in these sites. This waste can be transformed into valuable products, lessening the demand for new materials and preserving resources. The practice of recycling floral waste is a sustainable approach that aids businesses and communities in mitigating their environmental footprint. Furthermore, recycling can lead to economic prospects, including the creation of compost and fertilizers that can be marketed or utilized in landscaping initiatives (Sharma, 2024). Thus, this study is an attempt to review the current status of floriculture in Nepal, quantify flower waste generation and highlight the innovative recycling practices.

Materials and Methods:

The primary method of manuscript preparation is the review of past works, present status and recent innovations in the field of floral waste management in Nepal. Various published articles, books, booklets, reports, review papers and research papers were used as reference materials. Similarly, recent innovations made by people in Kathmandu for collection of floral waste, its processing and branding were observed and information were gathered through published articles and personal communication as well. Besides, numerous social media, internet sources showcasing the works were also explored. To amplify the future scope of floral waste management, possible strategies for floral waste management were also collected and presented.

Calculation of the wastage of loose flowers was done as per the following formula;

1. Annual flower wastage quantity of loose flowers (MT) = Total annual value of sales of loose flowers/ value of one kg of loose flowers at wholesale price (Rs. 200).
2. Wastage quantity of garland and other flowers = Total annual value of sales of garland and other flowers/Number of garlands per kg (4) and price of 1 garland (Rs. 50) (4 × Rs. 50 = Rs. 200).

As in above equation, the wastage quantity of loose flowers and garlands was calculated based on the annual sales of flowers and garlands in Nepal. Four garlands make a kg and cost 200 rupees. One garland costing 50 rupees at wholesale market.

Results and Discussion:

Status of floriculture business in Nepal

Coming to year 2023/24 AD, total of 1174 floriculture nurseries have been reported in Nepal and floriculture farms and activities are carried out with 260.18 hectares of land over 52 districts (Table 1). Yearly transaction in floriculture business has reached to 368.51 crores (Table 2). More than 51,500 individuals are directly or indirectly involved in the floriculture sub-sector (FAN, 2024). More significantly, this sub-sector has the potential to redistribute income from high class individuals and institutions to low income group contributing greatly to poverty reduction (The Rising Nepal, 25 October 2025).

Table 1. Status of floriculture business in Nepal

SN	Description	Fiscal years		
		2078/79 (2021/22 AD)	2079/80 (022/23 AD)	2080/81 (023/24 AD)
1.	Number of nurseries	751	1116	1174
2.	Total land use (ha)	178	221.76	260.18
3.	Number of districts	48	48	52
4.	Number of employee	39100	44000	51500
5.	Import of cut flowers (%)	26.58	18.15	25
6.	Number of flower show room	137	137	158
7.	Floriculture business in Nepal (yearly transactions in Rs '000)	2,303,408	3,076,390	3,685,127

(Source: Floriculture Association Nepal, FAN)

Major sub sectors of floriculture business in Nepal

Table 2. Major sub sectors of floriculture business in Nepal (Nepalese rupees in crores)

SN	Particular	Fiscal year (BS)		
		2078/79	2079/80	2080/81
1.	Seasonal flowers	26.9851	27.7946	28.4339
2.	Ornamental flower and plants	64.8937	95.3937	114.9494
3.	Cut flowers	33.4966	50.5799	58.1669
4.	Landscape and gardening	25.1464	28.9183	31.8101
5.	Open flowers (Loose flowers)	10.4687	12.0390	12.4001
6.	Marigold and other flower garland	39.4515	61.1498	87.7500
7.	Agro equipments	18.5944	20.4539	22.4993
8.	Others (carpet grass, rhizome, bulbs etc.)	10.3185	10.6280	11.6909
	Total (1 to 8)	229.3548	306.9572	367.7006

(Source: Floriculture Association Nepal, FAN)

Major cut flowers and loose flowers

Marigold (Sayapatri), Gompherena (Makhamali) and Chrysanthemum (Godavari) are the major loose flowers having high market demand during Dipawali festival in Nepal (Table 3). Marigold is the most popular and highly demanded loose flower in Nepal which is mainly used as garland during Tihar and Thuloekadashi as well as to offer and worship god and goddesses. Marigold garlands are popularly used in decorating marriage ceremonies, cars, podium or stages in various social functions, hotels as well as homes during special occasions (Prasain, 2021).

Table 3. Major cut flowers and loose flowers in Nepal

Cut flowers	Loose flowers
Gerbera	Marigold
Carnation	Gompherena
Rose	Chrysanthemum
Lemonium	Calendula
Stock	Corn flower
Gypsophila	Dahlia
Chrysanthemum	Daisy

Major consumers of flowers

Flori-business in Nepal has been concentrated in Kathmandu Valley since many years and major consumers are hotels, travel agencies, temples etc. (Table 4). However, the floriculture trade has now been extended to cities like Pokhara, Narayangad, Hetauda, Biratnagar, Dharan and Dhangadi (Pun et al., 2019).

Table 4. Major consumers of cut and loose flowers in Nepal

Consumers	Products
Hotels	Cut flowers/Loose flowers
Corporate/Banks	Cut flowers/Loose flowers
Travel agencies	Loose flowers
Government agencies	Loose flowers
Temples	Loose flowers
Homes	Cut flowers

Quantities of loose flowers consumed by the market

Demand of loose flowers in Nepal grows particularly during special occasions like festivals (Tihar, Chhatha, Thulo ekadashi, Dashain etc.), religious festivals, social functions, specific events and ceremonies such as wedding, birthdays, welcome, farewell as well as during funeral ceremony etc. A growing trend of gifting flowers has been observed especially during wedding, parties and other receptions. This study shows that the annual estimated loose flowers and garlands consumed by the Kathmandu market is around 5000 MT (Table 5). Loose flowers and garlands contribute 13.7 MT of garbage per day which is 1.1% of the 1263 MT of garbage produced in Kathmandu valley daily. According to Data collection survey on waste management in Nepal, the daily solid waste generation in Kathmandu valley is estimated at 1263 tonnes per day (JICA, 2024). Flower waste volume will increase significantly more if cut flowers are also included because its trade is five times more than loose flowers (FAN, 2024).

Estimated loose flowers and garlands recycled annually

This study shows that currently, only 100MT of potential 5000MT of flower wastage (loose and garlands) is recycled in Kathmandu (2%) (Table 6) while volumes of flowers offered in temples across the country is yet to be studied. According to Sharma (2025) the scope for growth is immense and cut flower wastage is presently unaccounted for and may be few thousand tonnes. Besides, recycling of flower wastage in temple and party venues across the country could help in recycling wastage and contribute to circular economy.

Leading startups in Kathmandu for floral waste recycle

Discarded flowers into incense sticks

Techniques have been established to produce floral incense sticks utilizing discarded flowers. At first, workers manually sort the flowers from the waste and treat them with organic bioculum to eliminate any chemical residues. Afterward, the dried petals are ground and mixed with natural resins and clay to form a dough-like mixture. The mixture is then shaped by hand into raw incense sticks and allowed to dry. In the final stage, the dried sticks are dipped in essential oils to impart a pleasant fragrance (Kalyankar, 2024).

Flowchart: Making incense sticks

1. Separate flowers from floral-waste
2. Sort the petals and dry under the sun
3. Grind the dried petals into a fine powder
4. Combine the powder with clay to form a dough
5. Mold the dough into incense sticks
6. Allow sticks to dry and coat them with essential oils
7. Finished incense sticks are ready for use

Waste to Worth: The story of Phoolprasad

Shushma Sharma (Wosti), a former banker, founded a business venture 'PhoolPrasad' in 2018, with the goal

Table 5. Estimated quantities of loose flowers consumed by the market in 2080/81

Type of loose flowers	Market sales (NPR in crores)	Estimated quantity (MT)/annum	Estimated quantity/day (MT)
Loose flowers	12.4	620 (NPR 200/kg)	1.7
Garland (marigold and other flowers)	87.6	4380 (NPR 50/garland × 4*= NPR 200)	12.0
Total	100	5000	13.7

*One kg of flowers comprises of 4 garlands costing Rs. 200.

Table 6. Estimated recycling of loose flower and garland wastage annually in 2081

SN	Name of company	Quantity (MT) (approx.)	Source
1.	Phoolparsad, Kathmandu	100	Temples, Party place, Residences, Offices, Collection during Tihar
2.	Bhoomithan, Kathmandu	0.5	Temples, Residences, Collection during Tihar
	Total	100.5	

of transforming the floral waste into incense sticks that are free from chemicals. By repurposing discarded flowers, Phoolprasad converts floral offerings of people into incense, allowing them to recycle and reuse in an innovative way. This initiative not only aids in solid waste management and the preservation of heritage sites but also generates job opportunities for women, fostering their financial independence (Sharma, 2025).

This waste prompted a profound insight: what if we could rejuvenate these cast-off blossoms? The journey commences with gathering discarded flowers from temples, weddings, and various events. After collection, floral wastage is sent to the workplace located in Kapan 11, where they are meticulously sorted, separated, cleaned, dried, and crushed. By combining traditional craftsmanship with modern techniques, artisans adeptly transform the floral waste into fragrant incense sticks. Each stick is imbued with the essence of the flowers, producing a harmonious blend of aromas that evoke nostalgia and foster serenity.

At the core of Phoolprasad's philosophy lies a dedication to sustainability. Phoolprasad transcends being merely a brand; it serves as a catalyst for positive transformation within communities. They are currently exploring the creation of Tibetan incense utilizing Dhupi and Sonapati, primarily employed during meditation. All floral products offered by Phool Prasad are environmentally safe, devoid of unnatural fragrances, and crafted by hand. The main market for Phoolprasad's products is international, specifically in America and various European nations. Phool Prasad has devoted careful consideration to its packaging, which is visually striking, despite the fact that it increases production costs. Additionally, they produce gift boxes made from Nepali handmade paper (Sharma, 2025).

Figure 1. Incense sticks and cones made from flower petals (Photo credit: Phoolprasad.com)

Phool to Phoolbatti: A story of Bhoomithan

Amod Karmacharya and Goonja Shrestha jointly founded Bhoomithan, (which means sacred earth) in 2022. This organization aims to provide environmental solutions in Nepal and has concentrated on recycling floral waste to produce Phoolbatti, or rope incense. They are working on creating a sustainable alternative to conventional stick incense. Their efforts have led to the development of various fragrance of rope incense from discarded flowers and Lokta paper. This initiative arises from the fact that people often choose stick incense for its pleasant aroma, despite it being infused with chemicals. Bhoomithan processes the flowers by sorting and drying them, blending the dried petals into a powder, and finally, women twist this powder along with other ingredients into rope incense. The products are primarily sold at local farmers' markets (Davis, 2024).

Figure 2. Rope incense out of recycled flowers (Photo credit: Bhoomithan.com)

Possibilities of recycling flowers in Nepal

A significant quantity of flowers remains unused after the conclusion of festivals and ceremonies or when events wrap up. On the other hand, flower farms may experience excess production, leading to waste during the harvesting, post-harvest handling, and marketing processes. Hence, there is a significant potential to reuse flower waste from temples by converting it into incense sticks that a sense of peace and calm. However, it is essential to determine the most efficient and cost-effective logistical methods for collection from these sources (Sharma, 2025).

Flower waste recycling involves transforming discarded flowers into valuable products or materials. This practice involves collecting flower waste from events, markets, farm and other sources, and then processing it to create incense sticks, compost, fertilizers and other products. Use of flowers is deeply rooted and is inescapable in various religious, spiritual as well as social functions in Nepal. Moreover, the government's stance on environmental conservation has further aligned with PhoolPrasad's mission. In line with Section 15 of Environment Protection Act 2019, Nepal's Ministry of Forests and Environment banned the production, sale, import, and distribution of plastic flowers with notification on Nepal Gazette on July 29, 2022, signaling a move towards more sustainable alternatives in religious and decorative practices (MoFE, 2022). This policy shift presents an opportunity for businesses like PhoolPrasad to lead the way in eco-friendly solutions.

Table 7. Major temples of Nepal where flower is offered on a daily basis

SN	Temples
1.	Pashupatinath Mandir, Kathmandu (Collection)
2.	Guheswari Mandir, Kathmandu
3.	Dhakshinkali Mandir, Kathmandu
4.	Bhadrakali Mandir, Kathmandu
5.	Sankata Mandir, Kathmandu
6.	Banglamukhi Mandir, Lalitpur
7.	Budhaneelkantha Mandir, Kathmandu (Collection)
8.	Manakamana Mandir, Gorkha
9.	Bindabasini Mandir, Pokhara
10.	Janaki Mandir, Janakpur
11.	Baglung Kalika Mandir, Baglung

Extraction of Natural dyes, pigments and essential oils

Khan and Rehman (2005) utilized *Rosa* spp. in extraction of essential oils. Vankar et al. (2009) reported the potential of floral waste to be employed in the production of dyes used in dyeing cotton, wool, and silk on a commercial scale. The petals of marigold (*Tagetus erecta*), which are primarily composed of carotenoids-lutein and flavonoid-patuletin, were identified, isolated, and utilized in textile dyeing. Perumal et al. (2012) gathered flowers from temples (rose, marigold, chrysanthemum, and jasmine) and shade-dried them and extracted essential oils. Raja et al. (2012) indicated that the saffron petals can be used to extract dye for Pashmina shawls. Naquvi et al. (2013) examined the petal oil of *Rosa damascena* extracted through hydrodistillation, employing gas chromatography or mass spectrometry methods. Jadhao

Alternative approaches for sustainable flower waste management

Strategies	Details	References
Composting	Turn flower waste into nutrient-rich compost to enhance soil health.	(Shukla et al., 2019)
Vermicomposting	Use worms to break down flower waste into valuable organic fertilizer.	(Punde & Ganorkar, 2012)
Organic dyes	Extract natural dyes from petals for eco-friendly textiles or crafts. Marigold and rose petals collected from temples are ideal for producing biodegradable dyes.	(Harlapur et al., 2020)
Artisanal soaps	Infuse flower extracts into handsome soaps for a sustainable skincare option.	(Ghonge et al., 2025)
Essential oils	Extract essential oils from discarded petals for natural fragrances and oils. In India, about 80% of rose flowers are processed into rose water, 10% into attar, and 1-2% into pankhuri. Rose oil is widely utilized by manufacturers as a fragrance in pharmaceutical products, particularly in ointments and lotions.	(Swati et al., 2024)
Natural cleaners and biopesticides	Process floral waste into eco-friendly cleaning solutions.	(Sharma, 2024)
Biodegradable packaging	Use floral waste to create sustainable packaging materials.	(Sharma, 2024)
Petal paper	Make handcrafted paper from flower petals, reducing overall waste.	(Sharma, 2024)
Flower recycling	Repurpose slightly wilted flowers for bouquets, decorations or potpourri.	(Sharma, 2024)
Bioenergy production	Convert floral waste into biofules for sustainable energy solutions.	(Rabadia, 2024)
Animal feed	Convert suitable floral waste into nutritious feed for livestock.	(Wadhwa & Bakshi, 2021)
Pigment extraction	Marigold flowers provide a rich source of lutein and carotenoids. Lutein is increasingly popular in the food industry and for textile dyeing. Extracts from marigold flowers are used as an poultry feed additive to improve egg yolk color.	(Sivel et al., 2014)

and Rathod (2013) executed an extraction process to obtain patuletin dye from French marigold flowers. Teli et al. (2013) separated dyes using hibiscus and marigold flowers, applied to fabrics of cotton and cotton/silk blend. Ravishankar et al. (2014) reported that flowers (rose, jasmine, marigolds, chrysanthemum, hyacinth, hibiscus, and tuberose) sourced from temples were utilized for the extraction of dyes and essential oils. Singh et al. (2017) investigated the natural dye present in floral waste from temples. Extraction of natural colors was carried out via ultrasonication and subsequently dried using a spray drier, with the residue following the dye extraction being rich in nutrients and noted for its potential as a resource material in itself.

Future of floral waste in Nepal

Nepal holds significant potential for floral waste management. Adopting flower recycling technologies not only minimizes waste but also strengthens the circular economy. Such initiatives contribute to a cleaner environment for future generations while ensuring a reliable supply of raw materials for various industries. With this vast opportunity, Nepal is well-positioned to embrace innovative floral waste solutions and foster successful startup ventures. Enhancing floral waste management infrastructure in Nepal demands a comprehensive approach. By systematically collecting floral waste from major temples and hotels, supporting the private sector in adopting smart technologies, setting up local recycling centers, and promoting eco-friendly products, the country can advance toward more sustainable practices. Nepal needs to expand a separate the local floral waste collection centres and waste segregation systems targeting the major sources of floral waste like temples, party palaces, flower shops and market, farms as well as homes on a daily basis to fetch flowers when various festivals, events, ceremonies, functions and celebrations come to an end.

Conclusion:

Nepalese floriculture industry has flourished into a vibrant industry over recent decades. However, generation and disposal of floral waste at the end of festival or ceremony has been an environmental and economic challenge. Encouragingly, emerging innovations in flower waste recycling such as incense production and development of natural products offer sustainable alternatives that honor tradition, address environmental concern as well as contribute to circular economy. Strengthening these efforts through supportive policies can help transform floral waste into valuable resource, ultimately fostering a greener, more resilient Nepal.

Declaration of conflict of interest and ethical approval:

The authors declare that they have no conflicts of interest regarding the published material. Ganesh Lamsal contributed to the review, data collection, and manuscript writing, while Umed Kumar Pun developed the study concept, collected data, and supervised the overall research and manuscript preparation. Both authors reviewed the document prior to submission to the Journal of Nepalese Horticulture. This article does not involve any human participants or animals, and prior approvals were obtained where applicable.

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