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GENERAL ARTICLE

Seasonal Migration Patterns and Practices of Litchi Beekeepers in Bihar

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Abstract

Bihar's litchi belt around Muzaffarpur, Samastipur, Sitamarhi, Vaishali, and Darbhanga supports one of eastern India's most organised migratory beekeeping systems. This article summarises migration routes, forage calendars, and practices used by commercial beekeepers who follow sequential blooms to sustain colonies and income reliably year-round. The cycle starts mid-March to early April in litchi (*Litchi chinensis* Sonn.) orchards for pollination and monofloral honey. Apiaries then shift among short in-state floral flows within Bihar after litchi to maintain brood and nutrition. During the monsoon dearth (June–October), colonies move to Uttar Pradesh and Rajasthan, sometimes northwestern Madhya Pradesh, to use sesame, millet, pigeon pea, ber, and ajwain. Rabi (November–February) provides the main secondary bee flora from mustard/rapeseed, with onion, coriander, and grass pea as support. Phenology-aligned logistics, pre-bloom equalisation, timely supering, judicious pesticide application, microclimate management, and pest management in bee hives underpin performance. Migration boosts honey yield, pollination returns, and colony demographics, while adaptive scheduling and integrated management address climate, invasive pest, and transport challenges.

Key words: Migratory beekeeping, bee flora, commercial beekeepers, honey yields and pollination

Introduction

Bihar's litchi belt (Muzaffarpur, Samastipur, Sitamarhi, Vaishali, and Darbhanga districts) attracts hundreds of migratory beekeepers each spring. Bee colonies arrive before the litchi bloom, build up on early nectar and pollen, and provide the cross-pollination that sets the crop (Samal et al., 2025). Once litchi flowering finishes by early April, beekeepers shift their hives through a predictable sequence of floral resources within Bihar and into neighboring states. The goal is simple: keep colonies on forage nearly year-round so they stay strong, productive, and ready to return to litchi the next season. Here we outline this seasonal pattern – including the timing, routes, and management practices – based on regional crop calendars and beekeeping guidelines.

Spring Anchor: Litchi Bloom in Bihar (Mid-March to Early April)

Bee hives are placed within and along the edge of an orchard to pollinate the crop (Bihar, India). Litchi flowers are available roughly from mid-March to early April in Bihar's prime litchi belt (Cronje et al., 2023). This is the first major nectar flow of the year and a critical pollination period for the region's famous litchi belt (Ghosh et al., 2024).

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Why it matters?

The litchi flow is the first big nectar source of the year and the economic anchor that often funds subsequent migratory moves. Colonies typically leave litchi bloom with abundant honey stores and expanded brood nests. This strong buildup helps them endure any forage gaps in late April. Beekeepers also harvest a premium monofloral litchi honey crop at this time, usually extracting the honey right after the bloom ends, before moving the colonies. It is important to extract litchi supers immediately and separately, to preserve the distinctive light, floral litchi honey character for the market. Once litchi flowering finishes (usually by the first week of April), the migratory journey continues.

Immediate Options of Post-Litchi Forage in Bihar (April–June)

After litchi, beekeepers disperse their colonies to a series of shorter, staggered bloom periods within Bihar. These minor flows from April through July keep the bees busy and fed, though each may last only a few weeks (Table 1). Post-litchi forage within Bihar is supported by a sequence of short, overlapping blooms that maintain colony nutrition and brood rearing. Jamun flowers mainly in May–June around Darbhanga and Muzaffarpur and provides a moderate nectar flow, yielding about

Table 1. Annual Migratory Calendar at a Glance (Information collected from local beekeepers of Bihar).

Month	Primary sources	Backup/Bridge
January	Mustard (*Brassica juncea* (L.) Czern.), Coriander (*Coriandrum sativum* L.), Grass pea (*Lathyrus sativus* L.), Berseem (*Trifolium alexandrinum* L.), Pigeon pea (*Cajanus cajan* (L.) Millsp.), Black nightshade (*Solanum nigrum* L.)	*Citrus* spp., Wild basil (*Ocimum gratissimum* L.)
February	Mustard, Coriander, Tisi/Flax (*Linum usitatissimum* L.), Semal (*Bombax ceiba* L.), Kusum (*Schleichera oleosa* (Lour.) Oken), Kerwa/Kewda (*Pandanus odorifer* (Forssk.) Kuntze), Broad bean (*Vicia faba* L.), Black nightshade, Rosewood/Shisham (*Dalbergia sissoo* Roxb.)	Fennel (*Foeniculum vulgare* Mill.), Jira/ Cumin (*Cuminum cyminum* L.), Snake gourd (*Trichosanthes cucumerina* L.), Bottle gourd (*Lagenaria siceraria* (Molina) Standl.), Early berseem, Chilli (*Capsicum annuum* L.), Karonda (*Carissa carandas* L.)
March	Watermelon (*Citrullus lanatus* (Thunb.) Matsum. & Nakai), Litchi (*Litchi chinensis* Sonn.), *Citrus* sp., Maize (*Zea mays* L.), Late semal, Fennel, Drumstick (*Moringa oleifera* Lam.), Ajwain (*Trachyspermum ammi* (L.) Sprague), Khira/Cucumber (*Cucumis sativus* L.), Karela/Bitter gourd (*Momordica charantia* L.), Nenua/Sponge gourd (*Luffa cylindrica* (L.) M.Roem.), Pointed gourd	Banana (*Musa spp*.), Onion (*Allium cepa* L.), Rosewood/Shisham, *Citrus* sp.
April	Jamun (*Syzygium cumini* (L.) Skeels), Sunflower (*Helianthus annuus* L.), Laal ghass (*Euphorbia macrophylla* Hook. & Arn.), Mung (*Vigna radiata* (L.) R.Wilczek), Till/Sesame (*Sesamum indicum* L.), Chilli (*C. annuum* L.), Muskmelon (*Cucumis melo* L.), Snake melon (*C. melo* var. flexuosus (L.) Naudin), Khira/Cucumber, Karanj (*Pongamia pinnata*)	Mahua (*Madhuca longifolia* (J.Koenig ex L.) J.F.Macbr.), Teak (*Tectona grandis* L.f.), Neem (*Azadirachta indica* A.Juss.), Banana (*Musa spp*.), Palmyra palm (*Borassus flabellifer* L.)
May	Jamun, Sunflower, Laal ghass, Mung, Till/, Banana, Chilli, Muskmelon, Snake melon	Teak, Pointed gourd, Banana
June	Sunflower, Chilli, Cucumber, Bitter gourd, Early urad/Black gram (*Vigna mungo* (L.) Hepper), Maize	Banana
July	Chilli, Khira/Cucumber, Bitter gourd, Maize, Brinjal, Pearl millet (*Pennisetum glaucum* (L.) R.Br.), Okra (*Abelmoschus esculentus* (L.) Moench), Sponge gourd, Pointed gourd	Banana, Motha (*Cyperus rotundus* L.)
August	Maize, Chilli, Sponge gourd, Bitter gourd, Buckwheat (*Fagopyrum esculentum* Moench)	Banana, Gumma (*Leucas cephalotes* (Roth) Spreng.)
September	Jamun, Dhaicha (*Sesbania bispinosa* (Jacq.) W.F.Wight), Cucumber, Chilli, Sponge gourd, Pearl millet/Bajra, Brinjal/Eggplant, Bitter gourd	Bhringraj (*Eclipta prostrata* (L.) L.)
October	Pigeon pea, Chilli, Brinjal/Eggplant, Karela/Bitter gourd, Gumma	Banana
November	Mustard, Karela/Bitter gourd, Chilli, Brinjal/ Eggplant	Banana, Tomato, Laheri grass/Khesari
December	Mustard, *Eucalyptus* spp.	—

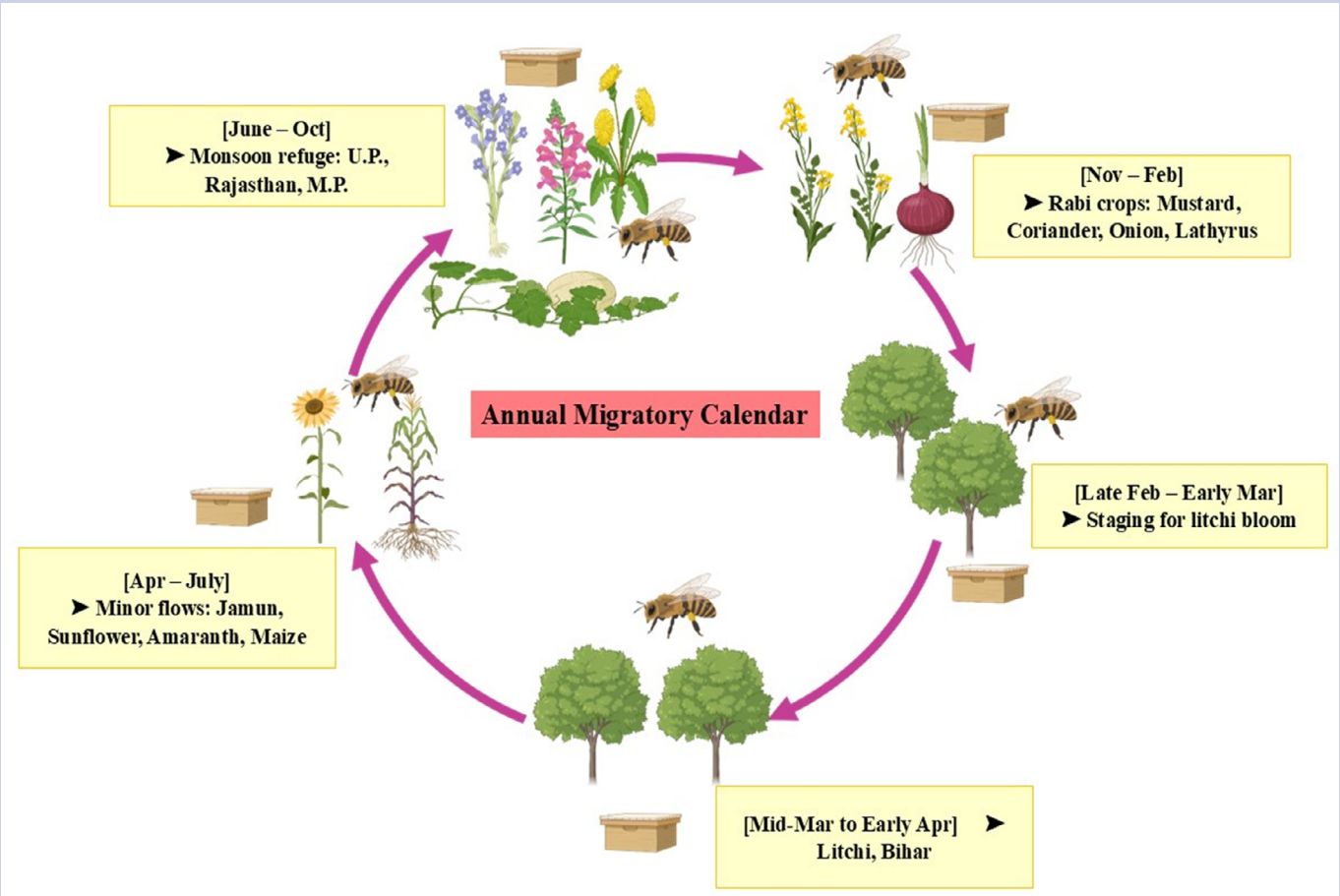

Figure 1. Pattern of migratory beekeeping followed by beekeepers in Bihar.

10–15 kg honey per colony in favourable years, so a portion of apiaries is commonly staged near jamun groves. Lal ghash (*Euphorbia macrophylla)* flowers during May–June and serves primarily as a pollen (and minor nectar) source under summer scarcity, aiding colony maintenance (Figure 1 and Figure 2). Sunflower is a stronger summer nectar and pollen resource, blooming from mid-May to early July in northeastern districts such as Purnea, and can produce a distinct honey crop, though heat-management (shade, water provisioning) is required during hot spells. With monsoon onset, maize tassels from early July to late August across central Bihar; it contributes protein-rich pollen but negligible nectar, supporting brood buildup rather than surplus honey, with foraging often constrained by heavy rains. To maintain uninterrupted forage, beekeepers often divide their colonies into two or more mobile groups and move them in a staggered manner between these short flows, ensuring that some hives are always positioned where nectar or pollen is available.

Jharkhand (Mid-April – late May): After the litchi season, many beekeepers migrate from Bihar to Gumla, Garhwa districts of western Jharkhand during April to May, when Karanj flowers blossom, attracting a larger number of honey bees. During the early-summer flows, many beekeepers migrate to Uttar Pradesh.

Monsoon and Early Kharif: Out-of-State Circuits (June–October)

By June, as the monsoon rains arrive in Bihar, many commercial beekeepers start migrating westward out of the state. This is done to avoid the prolonged heavy rains and dearth of blooms

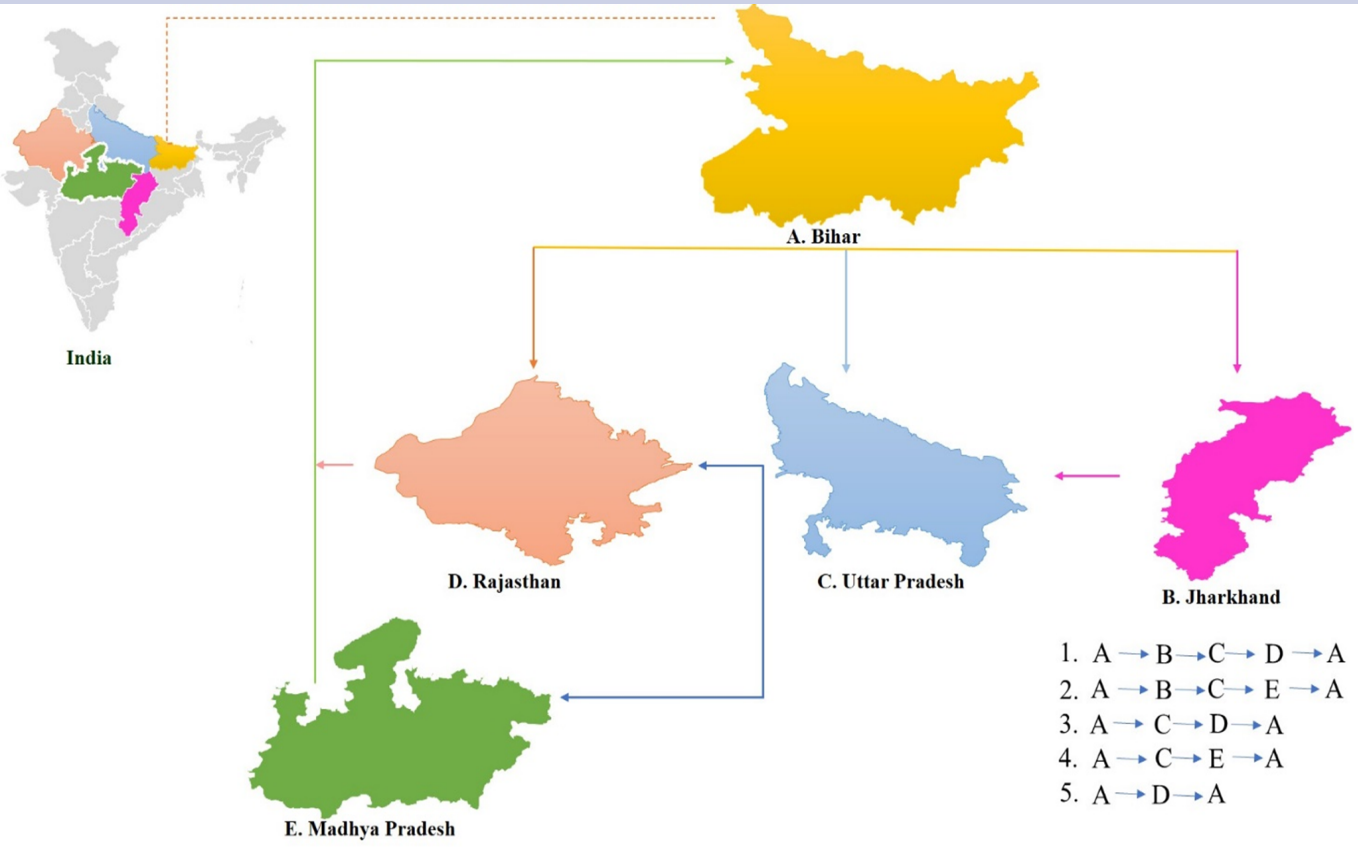

Figure 2. Seasonal migratory circuit of *Apis mellifera* apiaries in Bihar and adjoining states, aligned with major nectar flows (litchi in spring and mustard in winter) and intermediate dearth-period relocations

in Bihar's mid-monsoon period (late June through August). Neighbouring states often have more varied or earlier flowering during this season. Two common circuits are:

Uttar Pradesh (June–October): After litchi and early-summer flows, many Bihar beekeepers migrate to western/central Uttar Pradesh (e.g., Kasganj, Etawah, Badaun, Kanpur, Aligarh–Hathras–Firozabad belt). Monsoon crops such as pearl millet/bajra, pigeon pea, sesame, maize, and riverbed cucurbits provide staggered flowering from late July through September (Srivastava and Gautam, 1999; Dash et al., 2024; Tanwar et al., 2025). Individually, these are minor flows, but together they supply steady nectar and pollen, allowing colonies to maintain brood and survive the rainy-season dearth; honey harvest here is usually negligible, and colony maintenance is the priority (Figure 2).

Rajasthan (July–November): Some operators move further west into relatively drier eastern/northern Rajasthan (Bharatpur, Alwar, Hindaun, Gangapur and adjoining arid zones). Early kharif blooms of sesame and bajra can support colonies in July–August, followed by high-value autumn flows, notably ber in September–October and ajwain around October, with additional contribution from wild *Ocimum* sp. (Singh and Vats, 2006; Bal, 2014). Routes are chosen based on transport logistics and honey-market goals; some beekeepers target single monofloral crops, while others shift more frequently to ensure continuous forage (Figure 2).

Madhya Pradesh (October–early November): Before returning to Bihar for rabi blooms, some beekeepers make a short stop in

northwestern Madhya Pradesh (e.g., Shivpuri–Gwalior), where late ajwain and wild basil overlap in October and can yield small ajwain/tulsi honey while rebuilding brood. This final monsoon-circuit stop helps restore colony strength ahead of winter mustard flows, so colonies return by mid-October to early November in good condition for the main rabi honey season (Meena et al., 2017; Rawat and Kumar, 2024).

Rabi Season: Mustard and Companion Crops (November to February)

Winter rabi crops (sown October–November and flowering in winter) provide the most dependable honey flows after litchi and deliver the year's largest harvest for many migratory beekeepers. Mustard/rapeseed forms the backbone of this season, blooming for about 6–8 weeks from mid-November in Rajasthan and parts of Madhya Pradesh and later from late December to February in Bihar. Bihar-based operators often exploit early western mustard belts first, then return to Bihar districts with extensive mustard acreage for the peak flow. Under good conditions, rapeseed can yield roughly 25–40 kg of honey per colony, so colonies are strengthened in advance through requeening or combining weak units, timely supering to prevent swarming, and basic cold-season hive management during foggy weather; Brassica remains highly attractive even in winter. Smaller rabi blooms extend forage and diversify products, including onion seed crops in Rajasthan/M.P. during December, and Bihar's late-winter coriander and grass pea during January–February, which provide a short nectar/pollen bridge as mustard tapers. Colonies typically peak in population during mustard, enabling sequential harvests (mustard in January followed by a brief coriander crop in February) before the spring cycle restarts.

Pre-Season Staging and Return to Litchi (Late February to Early March)

By late February, the migratory loop is coming full circle. Beekeepers begin consolidating their apiaries back toward the litchi-growing belt of Bihar to get ready for the new cycle. This pre-spring staging period (last week of February into the first week of March) is used for equipment maintenance and colony health checks after the long travels. Common activities include: cleaning or replacing old dark brood combs with fresh foundation, repairing hive boxes and stands, and treating colonies for any pests or diseases (Jones et al., 2024) (e.g. a prophylactic treatment for *Varroa mites* or *Nosema,* if needed) now, so that no chemical treatments will be necessary during the upcoming litchi bloom. By early March, the goal is to have every colony with a large amount of sealed and emerging brood and a young, vigorous queen, so that when litchi flowers (around March 10th onward), the hives explode with foragers. Many beekeepers try to time their brood cycles such that the peak of new forager emergence coincides with the litchi flowering peak – this way, the maximum number of worker bees is available to collect litchi nectar and pollen (Kumari et al., 2024). Achieving this timing can be tricky, but it's a hallmark of the most experienced migratory operations. Just 7–10 days before the first litchi blossoms open, truckloads of bee boxes once again pull into the orchards of Muzaffarpur and beyond. The annual journey comes full circle, and the cycle repeats with the spring honey flow that started it all.

Migratory Beekeeping in Bihar: An Academic Recasting

In Bihar, the litchi bloom constitutes the principal early-season resource that sets the performance trajectory for migratory beekeeping

enterprises. Colonies that attain high strength during the March litchi flow typically generate substantial honey yields, thereby enhancing subsequent productivity. Average honey yield during this flow was estimated at 15–20 kg per colony, contributing roughly 30–40% of annual production. Building on this foundation, leading operators organise a year-round migratory circuit aligned with regional bee flora phenology: they capitalise on minor summer nectar flows within Bihar, relocate westward through the monsoon to sustain foraging activity and brood turnover, and exploit the major winter mustard (*Brassica* sp.) bloom before returning to home bases. Across migratory systems in India, total annual yields are often around 50–60 kg per colony obtained through 4–5 harvests, and operators typically move about a minimum of 300 colonies per seasonal shift, completing 3–5 migratory stops per year. Each relocation is synchronised with flowering calendars, while inter-flow intervals are used for timely supering, brood and queen management, and proactive control of *Aethina tumida* and other colony pests. Beehive operators reported honey sales of approximately Rs 100–130 per kg during the litchi season, implying a seasonal gross income of about Rs 13,000 per operator for an operation of 100 colonies. Net returns from migratory beekeeping in our sample were approximately Rs 5,200–6,500 per colony per year. Further, migratory operations can generate net profits of about Rs 2,900 per colony annually, several-fold higher than those typically achieved under stationary beekeeping systems.

The practice of "following the blooms" is associated with substantial gains in honey yield and pollination-related income, aligning with broader agricultural monitoring trends. Bihar, which typically provides three to four distinct honey flows annually, functions both as a key source region for major blooms (notably litchi and mustard) and as a recipient of migratory pollination services that enhance crop set and yields. However, increasing interannual climatic variability and invasive or resurgent pests are driving adaptive management, including temporal shifts in migration schedules in response to rainfall anomalies and the adoption of pest-control measures compatible with mobile operations. Overall, migratory beekeeping in Bihar sustains colony health and productivity through improved colony–crop synchrony at spring onset, thereby supporting regional agroecosystem resilience. Beyond its livelihood role, the practice contributes to India's evolving pollination-service framework by stabilizing orchard and vegetable production, while also serving as an adaptation pathway to market pressures and changing flowering calendars.

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