

## Success Story

### Scientific Migratory Beekeeping to State Level Pollination Enterprise: A Success Story of Young Beekeeper from Drought-Prone Marathwada

#### 1. Background

Shri Dnyaneshwar Malile, a young and progressive beekeeper from Latur district in the drought-prone Marathwada region of Maharashtra, comes from a farming family exposed to chronic challenges of climatic uncertainty, water scarcity, high cost of cultivation, and unstable horticultural incomes. Observing the persistent problems of low fruit set, high flower and fruit drop, uneven fruit development, and reduced marketable yield in crops such as pomegranate, guava, watermelon, muskmelon, onion seed, and sunflower, he identified poor pollination as a major hidden constraint limiting crop productivity, despite farmers' investments in inputs and management practices.



Initially engaged in small-scale honey production, Shri Dnyaneshwar Malile gradually reoriented his enterprise towards a pollination-centered agribusiness model after recognizing scientific evidence on the role of managed honeybee pollination in improving fruit set, seed formation, and yields. He developed a scientific migratory pollination plan by aligning bee colony movement with flowering calendars of major horticultural crops across different agro-climatic zones of Maharashtra, enabling year-round utilization of colonies and targeted pollination services during peak flowering periods.

Through structured partnerships with orchardists, FPOs, and seed producers, his apiary expanded into a key source of organized pollination support for major fruit and seed crops in the region. The pollination-driven approach improved crop productivity, produce quality, and yield stability for farmers while transforming beekeeping into a year-round, diversified income enterprise. This model not only enhanced farm profitability but also promoted pollinator conservation and adoption of pollinator-friendly practices, demonstrating how apiculture can evolve from honey production into a climate-resilient, productivity-enhancing support service for high-value horticulture in drought-prone regions.

#### 2. Situation Analysis / Problem Statement

In Latur district of Maharashtra, agriculture-based livelihoods are increasingly under stress due to recurrent droughts, erratic monsoon behaviour, declining groundwater levels, and limited irrigation availability, making nearly 70 percent of orchards and vegetable farms vulnerable to moisture stress. Despite rapid expansion of high-value horticultural crops such as pomegranate, guava, watermelon, muskmelon and onion seed across Maharashtra, farmers continue to experience low and unstable yields, poor fruit set, inferior fruit quality, and high proportions of unmarketable produce (20–35%), even after adopting improved varieties and micro-irrigation systems.

A major underlying constraint has been the decline in pollination services, caused by loss of wild pollinators (40–60% decline), excessive use of broad-spectrum pesticides, monocropping, and degradation of natural habitats. Reduced honeybee activity during flowering has resulted in lower fruit set, higher flower and fruit drop (18–25%), poor seed development, and yield gaps of 25–30 percent compared to attainable potential. Although the benefits of managed honeybee pollination are well established, organized pollination services and scientific migratory beekeeping systems were largely absent, with only 10–15 percent of orchard growers having access to professional pollination support.

Simultaneously, rural youth faced limited livelihood options, with traditional farming and wage labor providing seasonal and uncertain incomes. Beekeeping, despite being a low-land, low-water, climate-

resilient enterprise, remained underdeveloped due to lack of technical skills, organized market linkages, and scalable business models. The fragmented availability of floral resources and water for bees, especially during summer lean periods, further constrained colony survival and enterprise expansion.

Together, these factors created a dual challenge: declining orchard productivity due to pollination deficits and limited income-generating opportunities for rural youth. This underscored the urgent need for scientific migratory beekeeping and organized pollination services as integrated solutions to enhance horticultural productivity and create sustainable, climate-resilient livelihoods in drought-prone Marathwada.

### **3. Plan, Implement and Support**

To address the problems of poor natural pollination, declining wild pollinators, and sub-optimal productivity of horticultural crops in Latur district, KVK, Latur adopted a systematic strategy to promote scientific migratory beekeeping and organized pollination services as a viable solution. The intervention focused on strengthening the technical capacity of Shri Dnyaneshwar Malile as a lead pollination entrepreneur, creating demand for managed pollination among orchard growers, and establishing institutional and technical support mechanisms for sustainable expansion of apiculture-based enterprises.

At the planning stage, KVK scientists conducted baseline diagnostic surveys in selected pomegranate and guava orchards across Chakur, Ausa, Nilanga and Latur blocks, covering about 12 orchards (25 ha) over two flowering seasons. The surveys documented low fruit set (45–55%), high flower and fruit drop (18–25%), and inadequate presence of natural pollinators. Based on these findings, a location-specific pollination enhancement plan integrating scientific migratory beekeeping was developed, and Shri Dnyaneshwar Malile was identified as a lead pollination service provider.

KVK facilitated capacity building of Shri Dnyaneshwar Malile through advanced trainings on commercial beekeeping and pollination management, along with on-farm trainings for farmers and rural youth. Technical guidance was provided on colony multiplication, queen management, migratory planning, apiary disease management, and pollination protocols, supported by distribution of Marathi technical literature.

As facilitation support, KVK guided procurement of standardized hive boxes, nucleus frames, pollen traps, protective gear, honey extractors and migratory accessories, enabling expansion of the apiary from 120 to 350 colonies within two seasons, and further to over 1,000 colonies within four years. Continuous on-site consultancy on seasonal colony management, nutrition during lean periods, water provisioning and pest–disease management helped reduce colony mortality from 18–20% to below 6–8%.

To demonstrate benefits, demonstrations and extension programmes were conducted in pomegranate, guava, watermelon and onion seed crops. Managed pollination resulted in 28–35% higher fruit set and 22–30% higher marketable yield in fruits, and 35–45% higher seed set in onion seed plots. These results were shared through farmer field days and farmer–scientist interactions, creating strong demand for pollination services.

KVK also facilitated farmer–beekeeper interfaces and market linkages, standardizing pollination service norms and rental charges. Structured service agreements were initiated for 1,200–1,500 colonies per season, covering about 900–1,100 ha of orchards, helping formalize pollination as a recognized farm input. Regular advisories on timing and density of hive placement, pollinator-safe pesticide practices, and creation of pollinator-friendly habitats ensured effective service delivery.

Additionally, extension strategies such as exposure visits to the apiary unit, celebration of World Bee Day, and dissemination of success stories through local media were undertaken, sensitizing farmers and rural youth to the economic and ecological value of pollinators.

Overall, the integrated approach of KVK, Latur—combining diagnostic assessment, capacity building, demonstrations, facilitation of inputs, continuous technical backstopping and stakeholder linkages—successfully transformed Shri Dnyaneshwar Malile’s beekeeping activity into a structured, pollination-centered agribusiness enterprise, establishing a scalable and replicable model for promoting scientific migratory beekeeping as a sustainable livelihood option in drought-prone regions.

#### **4. Output**

Under the technical guidance of KVK, Latur, and with Shri Dnyaneshwar Malile functioning as a leading pollination service provider in Latur district and across Maharashtra, the interventions generated clear and measurable outputs in farmer capacity, crop productivity and quality, input use efficiency, and enterprise growth.

At the capacity-building level, more than 320 orchard growers and seed producers across Latur, Osmanabad (Dharashiv), Beed, Solapur, Ahilyanagar, Nashik, Pune, Sambhajinagar and Jalna were trained and sensitized on managed honeybee pollination and pollinator-friendly practices.

At the field output level, in year 2024 he conducted pollination services in 96 orchards covering ~420 ha of pomegranate, guava, watermelon, muskmelon and onion seed recorded 26–38% higher fruit set and 24–34% increase in marketable yield in pollinated plots compared to non-pollinated controls. Produce quality improved with better fruit size, uniformity, colour, and TSS; onion seed plots showed 30–45% higher seed set and improved germination.

At the plant protection and input-use level, adoption of pollinator-friendly practices resulted in a 15–20% reduction in chemical spray frequency, lowering crop stress and secondary disorders (fruit drop, malformation) and improving orchard vigor.

At the economic output level, participating farmers realized ₹35,000–₹85,000/ha/season additional net returns due to higher yields and 8–15% price premium for improved grades in pomegranate and better market acceptance in cucurbits; onion seed growers reported 20–30% higher seed yield and improved contract rates.

At the enterprise output level, Shri Malile’s apiculture production scaled significantly: honey output increased from ~1-2t/year to >8 t/year, with standardized quality; value-added outputs reached ~500 kgs/year of bee pollen, strengthening income diversification.

A key institutional output was the establishment of Maharashtra’s first organized Nucleolus Queen Production Unit, producing ~1000 quality queens/year, supplying beekeepers across Latur, Pune, Nashik, Satara, Solapur and Ahmednagar, resulting in 18–25% improvement in colony performance and honey yield among secondary beneficiaries.

Overall, the integrated KVK-led approach, anchored by Shri Dnyaneshwar Malile, delivered measurable gains in farmer skills, yield and quality, reduced chemical use, higher farm profitability, and strengthened apiculture capacity, contributing to a robust pollination service ecosystem in Maharashtra.



Shri Dnyaneshwar Malile Pollination Service in Pomegranate Crop



Pollination Service in Sunflower Crop

## 5. Outcome

The sustained interventions facilitated by KVK, Latur, with Shri Dnyaneshwar Malile as a lead pollination service provider and nucleolus queen producer, led to the horizontal spread of managed honeybee pollination and scientific migratory beekeeping across multiple districts of Maharashtra. Over four cropping seasons, adoption expanded from <20 ha (Year-1) to ~1000 ha (Year-4) across Latur, Osmanabad (Dharashiv), Beed, Solapur, Ahilyanagar, Nashik, Pune, Sambhajinagar and Jalna, benefitting ~600 orchardists, seed producers and vegetable growers. Diffusion was strongest in pomegranate, guava, watermelon, muskmelon and onion seed belts, where visible yield and quality gains accelerated adoption. Secondary beneficiaries realized average additional net income of ₹ 32,000–₹ 78,000/ha/season due to improved fruit set and marketable yield. At the landscape scale, the annual incremental farm-level benefit is conservatively estimated at ₹ 40 lakhs across the nine districts, reinforcing managed pollination as a cost-effective productivity input and driving repeat contracts.

Adoption of pollinator-friendly practices resulted in 18–25% fewer insecticide sprays, lowering cultivation costs by ₹ 3,000–₹ 6,500/ha and reducing collateral damage to beneficial insects. In select clusters, 10–12% fertilizer savings were reported due to better crop load management.

Produce quality improved markedly—uniform size, better colour, higher fruit weight, and improved seed fill—leading to 8–15% higher prices in wholesale markets. Higher A/B grade recovery in pomegranate and guava and reduced deformities in melons improved market acceptance; onion seed quality (TSW, germination) strengthened farmer bargaining power with seed firms.

At the household level, ~62% of beneficiary families reported improved income stability; average household income rose by ₹ 1.2–₹ 1.5 lakh/year after two seasons, enabling investments in drip irrigation, orchard rejuvenation, housing, education, and small machinery.

The model catalyzed local apiculture ecosystems: 08 new youth-led units (30–150 colonies each) added ~1000 colonies regionally. Supply of quality nucleolus queens from Shri Malile's unit underpinned rapid scaling and colony performance among secondary beekeepers.

Overall estimated annual monetary outcome: ₹ 40 lakh across nine districts (incremental crop income + input savings + quality premium), confirming pollination-centered apiculture as a scalable, climate-resilient solution for horticultural productivity and rural livelihoods in drought-prone Maharashtra.

## **6. Impact**

The promotion of scientific migratory beekeeping and managed honeybee pollination in Latur district, led by Shri Dnyaneshwar Malile with technical facilitation from KVK, Latur, generated measurable district- and state-level impacts over 4–5 years, influencing production systems, farm incomes, social well-being, environmental resilience, and institutional development across major horticulture belts of Maharashtra.

At the technological and production system level, organized pollination services contributed to an expansion of 12–18% in the area under pomegranate and guava in selected talukas of Latur, Dharashiv (Osmanabad), Jalna and Beed, as improved fruit set reduced production risk and encouraged orchard establishment. The area under onion seed and hybrid vegetable seed production increased by 9–14% in pockets of Nashik, Pune and Solapur, supported by reliable pollination services. Adoption of modern orchard practices (drip irrigation, mulching, canopy management) increased by 20–30%, alongside higher uptake of farm tools (power sprayers, mulchers, pruning tools), reflecting technological upgrading of horticulture systems.

From a production and productivity perspective, managed pollination resulted in 8–12% district-level productivity gains in major fruit crops. Across nine districts, incremental production attributable to improved pollination, improving supply stability and reducing seasonal market volatility.

The economic impact was substantial. Additional crop value generated through pollination services was conservatively estimated at ₹2-3 crore/year across Marathwada and Western Maharashtra. Commercial apiculture enterprises, strengthening the rural agribusiness economy and stimulating allied activities (transport, packaging, marketing, processing).

The social impact included improved household well-being and human capital investment. In beneficiary villages, the proportion of households investing in children's higher education increased. 42–47% of participating families reported housing upgrades and asset creation, while youth engagement in apiculture-led agripreneurship increased, contributing to reduced distress migration.

Environmental benefits were realized through pollinator conservation and ecosystem resilience. Pollinator-friendly practices and rationalized pesticide use led to a 15–25% reduction in hazardous sprays

during flowering, aiding recovery of beneficial insect populations. Managed pollination improved fruit set stability under heat waves and dry spells, while flowering cover crops and boundary plantations enhanced on-farm biodiversity and microclimate buffering.

At the institutional and infrastructural level, the model catalyzed establishment of honey processing and storage units in Latur, with aggregation centers in Solapur and Nashik, and the emergence of regional queen breeding/nucleus colony hubs. Formal linkages with FPOs, seed companies, horticulture departments and private buyers helped institutionalize pollination services within horticultural value chains.

Overall, the intervention demonstrates that pollination-centered apiculture integrated with scientific migratory beekeeping is a transformative, scalable technology delivering multi-dimensional benefits—productivity, income, social mobility, environmental resilience, and institutional strengthening—and acts as a strategic enabler for horticultural growth and climate-resilient rural development in drought-prone Maharashtra.



Migration of Honey bee colonies up to Himachal during pollen dearth period



Grafting eggs in cell with royal jelly for Nucleolus Queen production



Pollen Collection using Pollen Collection Trays



Quality Honey production using Super Frames

Pollen collection during Winter season



Dnyaneshwar Malile involved regularly in Honey bee Awareness programs