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Original Article**Buzzing Success: Baldev Singh's Journey in Sustainable Beekeeping**

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Apiculture, or beekeeping, is important in India's rural economy, notably as a complement to farmers' income. It improves pollination, increases crop output, and promotes food security and biodiversity. S. Baldev Singh of Ludhiana, a dedicated beekeeper since 1995, exhibits successful entrepreneurship in this discipline. Baldev, inspired by his uncle, took out a loan to start Baldev Bee Farm, where he now oversees 700 honey bee boxes spread across several regions, producing premium honey from Italian bees (*Apis mellifera*). His operations prioritize sustainable practices, utilizing a variety of pollen sources such as mustard, litchi, and eucalyptus, and producing 4900-7000 kg of honey each season. Baldev's journey includes formal training at Punjab Agricultural University as well as unique management solutions to address typical beekeeping difficulties. He also exports honey to other markets such as Germany and the United States. Baldev hopes to expand his organic honey business and capitalize on the growing global demand for natural products. He promotes an entrepreneurial spirit among farmers, supporting self-sufficiency and creativity to attain wealth in rural communities.

Keywords: Apiculture, Sustainable Agriculture, Honey Production, Italian Bees, Organic Honey, Entrepreneurship.

INTRODUCTION

The activity of keeping bee colonies alive, also known as apiculture, is done mostly for the purpose of producing honey, beeswax, and other important goods like propolis and royal jelly. In India, beekeeping is essential to the rural economy, particularly for farmers who use it as supplemental source of income. Pollination, which greatly improves crop productivity and quality, especially in fruits, vegetables, and oilseeds, depends on honeybees. Both food security and biodiversity conservation benefit from this. Beekeeping has become more popular as a sustainable source of income due to the growing demand for organic honey and other products derives from bees, both locally and abroad. It also contributes to environmental sustainability and the creation of jobs in rural areas, which is in line with India's emphasis on agriculture-led economic growth. S. Baldev Singh, a 49 year old resident of Ludhiana, has been dedicated beekeeper since 1995. With a senior secondary education, he embarked on his journey in apiculture at a young age, gradually turning

his passion for honey production into a thriving business. Over the years, his hard work and expertise have enabled him to expand his operations, exporting high quality honey to international markets. Baldev Singh's business stands as a testament to his commitment to excellence and sustainable agriculture, making him a respected figure in the beekeeping industry.



S. Baldev Singh (Baldev Bee Farm)

Inspiration: Baldev Singh's journey into entrepreneurship was inspired by his uncle, who was involved with Punjab Agricultural University (PAU) in the field of beekeeping. Baldev's dream was to become an entrepreneur, but he did not receive any financial support from his family to start his business. Determined to pursue his goal, he took a loan of ₹86000 from the Land Mortgage Bank and added ₹1.5lakh of his own money. He started his beekeeping venture alongside his uncle and in partnership with PAU. Initially, PAU sold five boxes of Italian bees, out of which Baldev Singh bought one to begin his business. He began by rearing bees on sunflower crops. An interesting aspect of his journey is that instead of repaying the loan in cash, Baldev provided honey to the bank as a way of clearing his debt. His business has since grown successfully, and he now operates in four different districts, becoming a thriving entrepreneur in the beekeeping industry.

Training: Baldev Singh underwent a one week training program at Punjab Agricultural University (PAU) in 1994 to gain certification and deepen his knowledge of beekeeping. This training was under the guidance of Dr Avtar Singh Atwal, the former Dean of Post Graduate Studies at PAU, who is renowned for introducing the highly productive Italian honeybee to Punjab. This exotic species has significantly boosted honey production in the region, and Baldev Singh benefited from Atwal's expertise during his training, equipping him with valuable insights into modern beekeeping practices.

Current Status: Baldev's Bee Farm operates with 700 honey bee boxes spread across different districts, utilizing a variety of pollen sources such as mustard, litchi, and eucalyptus to sustain the bees. Out of the total, 250 boxes are located in the forested area of Kapurthala, which provides an ideal environment for honey production. The diverse pollen sources contribute to the quality and quantity of honey produced. From each box, Baldev harvests between 7-10 kg of honey in a single collection. This approach not only helps maximizing the honey yield but also supports sustainable beekeeping practices by making use of natural forest areas for bee farming. Through this careful selection of location and pollen sources, Baldev ensures high quality honey production while maintaining ecological balance.

Species of Honeybee: Baldev Bee Farm has found remarkable success through its cultivation of the Italian bee species, *Apis mellifera*, an exotic species known for its impressive honey production and resilience. With parallel comb structures and a size larger than all other honeybee species, except for *Apis dorsata*, these bees offer exceptional yields of 25-40kg of honey per colony. Originally imported from European countries, Italian bees have proven to be highly effective for commercial apiculture due to their lower tendencies to swarm or abscond, making them a perfect choice for sustainable and efficient honey production at Baldev Bee Farm.



Italian bees (*Apis mellifera*)

Structure of bee hives: Simple wooden boxes serve as artificial beehives, providing a safe and controlled environment for honeybees to thrive. These boxes can be stacked in a superstructure format, allowing for efficient management of bee colonies and honey production. One of the most popular designs is the Langstroth beehive, invented by Lorenzo Langstroth in 1851. The Langstroth hive consists of several key components. The base is a sturdy bottom board that supports the hive and keeps it off the ground. Above this is the brood chamber, where the queen lays her eggs and the worker bees raise the young. The brood chamber is typically divided into frames that hold comb, allowing bees to build their nests and store honey. On top of the brood chamber, additional supers can be added to accommodate honey storage. These supers also contain frames and can be removed when full, making honey harvesting easier. The hive is usually topped with a cover to protect it from the elements. A queen excluder can also be placed between the brood chamber and the supers, preventing the queen from laying eggs in the honey supers.

Ventilation is crucial for maintaining the hive's internal environment, and many Langstroth designs include screened bottom boards for airflow. The modular design of the Langstroth hive allows beekeepers to customize the size and configuration, making it a versatile choice for both hobbyists and commercial beekeepers. Overall, the Langstroth hive's efficient structure supports healthy bee colonies and maximizes honey production.



Structure of bee hives (Baldev Bee Farm)

Pollen traps: The purpose of pollen traps is to gather pollen as honey bees arrive at their colonies. Although the bees collect pollen from flowers while foraging, after they return, they are unable to remove the pollen themselves. Rather, the traps are positioned near the entrance to the hive so that the bees can pass through and the traps can catch some of the pollen the bees bring back. This procedure aids in the collection of priceless pollen by beekeepers for a variety of applications, including dietary supplements and home cures, and it also advances research into the behaviour and health of bees.

Honey production: The production of premium honey reached as astounding 4900-7000kg in a single season. In order to maximize their products export potential, mustard pollen is used especially to ensure maximum flavor and marketability. Furthermore, when packaging the honey, litchi and eucalyptus pollen are used to add distinct floral scents that improve the products overall quality and appeal. In addition to maximizing the honey's export worth, this deliberate utilization of pollen sources highlights the region's variety of flavors.

Management: Baldev uses a holistic approach to management in order to address major beekeeping issues, specifically European fall brood and sac brood disease. He uses 85% formic acid and mite strips to fight mite infestations in the winter, which helps to regulate the mite population and maintains ideal hive temperatures. He gives the antibiotic tetracycline to European fall brood and makes sure every box is well managed to avoid cross contamination. Baldev maintains a strict cleaning schedule, using acid twice a year to disinfect the hives and refraining from cleaning during dry spells to preserve hive health. To ensure a proactive approach to bee care, he also applies sulfur dust at the base of the hives to guard against disease and pest attacks.

Challenges: In April, the region faces issues such as pollen deficit, which harms the local ecosystem. Furthermore, maintaining consistent temperatures during the rainy season can be difficult, exacerbated by variable humidity levels. To deal with these environmental challenges, many locals relocate to Srinagar during the summer, seeking a more favorable climate and better conditions for their health and well-being.

Output: Each beehive produces 7-10 kg of honey per harvest, resulting in an average net profit of ₹3,000 per colony per season. In addition to local sales under their own brand in India, they have successfully exported honey products to Germany and the United States, demonstrating their commitment to quality and broadening their market

reach. This mix of local and international business not only increases profitability, but it also strengthens the brand's position in the competitive honey market.

Future goal: Baldev Singh wants to build his organic honey company. He currently sells his premium honey products effectively in the United States and Germany, where there is an increasing demand for natural and organic products. With a commitment to quality and sustainability, Baldev hopes to expand into new foreign markets, capitalizing on the growing trend of health-conscious consumers seeking organic alternatives. His goal is to build a global footprint by exporting honey to nations with burgeoning organic product markets, thereby improving his brand's reputation and sales. Baldev is prepared to make a huge influence in the global honey sector by spreading the benefits of organic production through strategic collaborations and targeted marketing activities.

Farmer's message

Farmers feel that prosperity should be a universal aim, encouraging people to embrace entrepreneurship rather than seeking regular career options. They emphasize the importance of making decisions in one's own life and building necessary abilities for company ownership. Furthermore, they encourage parents to actively assist and motivate their children on this journey, creating an environment conducive to invention and self-reliance. Nurturing these principles can help to foster an entrepreneurial culture, leading to greater fulfillment and economic prosperity.

SUMMARY

S. Baldev Singh, a passionate beekeeper from Ludhiana, India, has successfully turned his passion for apiculture into a thriving business since 1995. Inspired by his uncle's participation with Punjab Agricultural University (PAU), he surmounted financial obstacles by obtaining a loan and beginning with one box of Italian bees. Baldev uses 700 beehives spread over four districts to create high-quality honey from a variety of pollen sources. His enterprises produce 4,900–7,000 kg of honey per season, which he sends to markets in Germany and the United States. Baldev, who is committed to sustainable methods, wants to take his organic honey brand global, encouraging farmers to become businesses and emphasizing the need of skill development and innovation for economic growth.