

Drone Technology in Tasar Sericulture: A Future Prospect

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Introduction

Traditionally, sericulture has primarily focused on mulberry silk production. However, with the increasing demand for sustainable and eco-friendly practices, Vanya (non-mulberry) sericulture has gained traction. Tasar silk, derived from wild silkworms, offers unique qualities and is well-suited for niche markets. In recent years, the agricultural landscape has seen a notable transformation with the integration of cutting-edge technologies. One such innovation making waves in sericulture may be the utilization of drone technology in Vanya silk farming. This dynamic integration promises to revolutionize the sericulture industry by enhancing efficiency, precision, and overall silk production. The incorporation of drone technology in Tasar sericulture aims to address challenges associated with traditional methods and propel the industry into a new era of productivity and sustainability.

Need For Drones in The Tasar Sericulture

India produced 1.318 MT of Tasar raw silk in 2022–23. The tropical Tasar (*Antheraea mylitta* Drury) culture is practiced in the central and southern plateau region in the humid and dense forest areas covering the states of Bihar, Jharkhand, Chhattisgarh, Madhya Pradesh, Odisha, West Bengal, Uttar Pradesh, Andhra Pradesh, Telangana, and Maharashtra. It is estimated that about 3.5 lakh farmers are engaged in Tasar activities. Jharkhand, the leading Tasar-producing state, provides employment to about 2.2 lakh farmers in the rearing, reeling, spinning, and weaving sectors. Tasar silkworm is polyphagous, with 51 known host plants influencing their rearing performance. However, for optimal cocoon production, specific host plants such as *Terminalia arjuna*, *Terminalia tomentosa*, *Shorea robusta*, and *Lagerstroemia speciosa*



are recommended in India. Forests, especially Sal forests, serve as significant sources of naturally grown cocoons, collected regularly by tribal communities. The quality and quantity of Tasar silk depend heavily on the nutritional value of the host plants, which directly affect larval growth, survival rates, pupal weight, and cocoon characteristics.

Despite its potential, the Tasar sericulture industry faces numerous challenges, including climate change, land use shifts, shrinking forest covers, and insufficient infrastructure and manpower. Disease (leaf spot, powdery mildew, black nodal girdling, stem canker, leaf curl, die back, damping off, leaf rust, and wood rot) and pest infestations pose major threats, with pests like gall insects, stem borers, caterpillars, tussock moths, weevils, webbers, miners, beetles, and termites causing substantial damage to the host plants. On the other hand, uzi fly, yellow fly, wasp, bugs, birds, monkeys, etc. attack the tasar larvae. Disease outbreaks, such as pebrine, virosis, bacteriosis, and muscardine, further contribute to crop losses, estimated at nearly 40% in India. Control measures mainly rely on chemical insecticides, which have their limitations.

To improve cocoon crop stability, some silkworm rearers have adopted advanced rearing technologies, including timely pruning of host plants, field disinfection, the use of nets for chawki rearing, and application of the organic fertilizers and foliar sprays. However, maintaining these practices, especially in large forest areas, poses challenges due to labour shortages and the remote nature of many plantations. Thus, there's a crucial need for easily deployable machinery to aid in plantation maintenance and monitoring.

In response to these challenges, the integration of advanced technologies like drones is vital. Drones can efficiently monitor plantations, detect pests and diseases early, and assist in precision sericulture practices. Embracing such technologies is essential for adapting to changing demands and achieving a more data-driven and technologically advanced approach to Tasar sericulture, known as Silk farming 4.0.

Benefits of Drone Technology in Tasar Sericulture

Drones play a significant role in agro-forest ecosystems due to their ability to gather data efficiently, monitor crop health, and aid in precision Tasar sericulture practices. Here are some reasons why drones are needed in agro-forest ecosystems (Figure, 1):

- **Precision Forestry:** Drone technology provides detailed data on forest type, habitat nature, fire incidences, tree health, soil conditions, and growth patterns, as well as the



as well as the abundance and distribution of the host plants, enabling farmers to optimize foliage usage and promote sustainable Tasar rearing practices.

- **Eco-race conservation:** the Tasar silkworm has 45 eco-races, which are distributed in different forest areas across the country. Hence, the spatio-temporal distribution of these eco-races and their populations can be easily monitored through drones, which helps with *in-situ* conservation.
- **Monitoring and Surveillance:** Drones equipped with advanced cameras and sensors allow for real-time monitoring of Tasar culture, aiding in the early identification of potential threats to both the Tasar silkworm and the host plants, such as pests, predators, and diseases.
- **Climate Monitoring:** Drones equipped with weather monitoring instruments contribute to climate data collection, helping farmers make informed decisions related to brushing, application of disinfectants, and care of the silkworms.
- **Raising new plantations:** Since Tasar culture is forest-based, the development of food plants will be difficult, and so the utilization of drones for seed dispersal, pesticide and fertilizer application will be easier through drones.
- **Harvesting Assistance:** Drones can streamline the locations, spinning stages, and cocoon abundance in a forest area. This information is very crucial to the tribal people's timely harvest of cocoons.
- **Reduced Labor Costs and Risk:** Automation through drones optimizes the need for manual labor, reduces human-animal conflict, and allows farmers to manage larger areas effectively.

How Can This Be a Business Venture in The Tasar Sector?

Being a labor-intensive business, Tasar culture is currently threatened by a workforce shortage, which calls for mechanization to both lower production costs and ensure the industry's prosperity. As a result, it gives a business owner plenty of room to develop and provide the right machine or machines, or appliances, to meet the needs of the farmers. However, purchasing such drone gadgets by a progressive Tasar farmer with a stable financial situation may be advantageous, but the majority of these small-scale farmers find it prohibitive because of their precarious financial situation. If such a company exists, it could be profitable for an entrepreneur to contract them out to the Tasar sericulture farmers and provide them with

drone assistance. It will result in a significant profit venture that will not only sustain the business company but also the Tasar farmers.

Conclusion

The integration of drone technology in Vanya silk farming represents a pivotal moment in the evolution of sericulture. As the demand for sustainable and ethically produced textiles continues to grow, the adoption of innovative technologies becomes imperative. By harnessing the capabilities of drones, Vanya silk farmers can improve efficiency, yield, and sustainability, contributing to a more environmentally friendly sericulture industry. As drone technology advances, the future of Vanya silk farming looks promising, blending tradition and modernity in the pursuit of silk production excellence.

Figure1: Application of Drone technology in Tasar culture.



Host Plants of Tasar silkworm



Drone fumigation in the Tasar food plantation



Tasar Silkworm at Different Stages





Pest and Disease Infestation in Tasar host plants

