

Seed-Bombing Project Report

The technical report details the design and development of a drone-based seed shooting system intended to aid reforestation in the challenging, diverse terrains and climates of Nepal, focusing on environmental factors like monsoon weather and varying altitudes that dictate the drone's operational requirements. The analysis covers various seed shooting mechanisms, evaluates commercial solutions like those from Agrodronas, and utilizes mathematical models to calculate essential parameters such as the required seed velocity for successful soil penetration, drawing comparisons to paintball guns and table tennis machines. After developing and evaluating distinct drone design concepts against criteria like cost and reliability, we selected a hybrid system featuring a pyramid-shaped hopper to prevent congestion and a shooting mechanism powered by electromotor-driven flywheels, one of which is mounted on spring-tensioned arms to compensate for inconsistent seed size.

The high-altitude terrain of Nepal, characterized by difficult-to-access mountain slopes, faces a critical challenge where frequent **landslides** leave large areas devoid of vegetation, necessitating reforestation to enhance **stability, water drainage, and biodiversity**. To achieve these community goals, a drone-based seed-shooting system is currently employed to launch seeds from a height of ten meters; however, its effectiveness is significantly limited by two main operational drawbacks: the mechanism is **relatively slow in shooting** seeds, and the drone can only carry a **limited quantity of seeds** per flight, making optimization of both the firing speed and payload capacity critical for successful large-scale reforestation efforts.

The primary aim of the report is to define an improved seed-shooting drone system that resolves the existing drone's limitations of slow shooting and limited payload, specifically by enhancing the system to carry a capacity of approximately **200-400 seeds** and ensure **continuous, jam-free operation**. A critical technical goal is to enable the shooting mechanism to function effectively from an increased height of **30 meters**, while also focusing on **minimizing electricity consumption** to guarantee efficient and sustainable reforestation activities across Nepal's remote and challenging terrains.



