



BRING ON DRONE TECHNOLOGY IN PAKISTAN'S AGRICULTURE: REGULATORY CONSTRAINTS

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In the constantly evolving of modern agriculture, incorporating drone technology, also known as Unmanned Aerial Vehicles (UAVs) or Unmanned Aircraft Systems (UAS), presents a watershed moment with far-reaching consequences, and sustainability. Introducing drone technology is particularly important in Pakistan, a country whose agriculture is full of inefficiencies in input application due to skill deficits.

Pakistan's agriculture sector is vital to its economy, employing a large portion of the population and contributing substantially to GDP. The important crops include wheat, rice, sugarcane, and cotton, with rice and wheat being staple foods and major exports. Despite its economic importance, the sector struggles with outdated farming practices, water scarcity, and land degradation. Drones offer substantial advantages in the agricultural sector where accuracy and operational efficiency are essential. Drones equipped with advanced sensors and supported by artificial intelligence (AI) algorithms reduce the need for costly ground surveys and manual labor. They enable targeted treatment applications, minimizing pesticide and nutrient use, which reduces the total input, saves money, and lessens their impact on the environment by giving each plant only the necessary amount of fertilizer or pesticide. Additionally, the integration of

machine and deep learning technologies has the potential to significantly revolutionize drone capabilities by allowing autonomous decision-making methods while in flight.

Drones have a variety of applications that promise to transform farming techniques. These applications include

- Accurate crop monitoring
- Real-time plant health evaluation
- Disease identification
- Abiotic and biotic stress detection
- Optimized input application (e.g., fertilizers and pesticides)
- Optimal irrigation system operation

The Pakistan Civil Aviation Authority (PCAA) is primarily in charge of monitoring the regulatory framework that governs drone activities in Pakistan. The Civil Unmanned Aircraft Rules, 2024, provide comprehensive and stringent guidelines for the import, use, licensing, and security clearances of UAVs. However, there are major challenges to the efficient application of these rules, which hinder the prompt deployment and successful operation of drones in agricultural contexts. The requirement of obtaining a No

Objection Certificate (NOC) from the Ministry of Defense before bringing drones into Pakistan is an important challenge. The procurement of vital equipment required for agricultural operations is sometimes delayed by this bureaucratic process, which might take several months.

Drones are used for scheduled tasks but also need to perform emergent operations owing to sudden pests' effects or other emerging input applications. The ongoing requirement for NOCs before every drone flight adds operational complexity. Furthermore, operational planning is made more difficult, and considerable collaboration with regulatory authorities is required due to the rigorous adherence to airspace laws, which include restrictions regarding proximity to airports and sensitive locations. All of these issues highlight the necessity of more efficient regulatory procedures and improved coordination systems to enable drone technology to be seamlessly incorporated into Pakistani agriculture.

Pakistan has to reevaluate its regulatory strategy to comply with international norms while taking into account regional differences in the face of these difficulties. The cooperation of key stakeholders, including technology providers, agricultural groups, and regulatory agencies, is necessary to improve operational flexibility, expedite the approval process, and create an environment that encourages innovation. Further, the introduction of a service provider model, attached with comprehensive training for drone operators and the establishment of pilot licensing is a crucial step toward efficient drone deployment.

Despite the drone technology has considerable potential, there are a lot of significant hurdles in Pakistan that prevent it from being widely used, especially convoluted regulation. Airspace management, safety procedures, data privacy, and licensing regulations are only a few of the factors that need to be taken into account while regulating UAVs and UAS; these factors also change among different regions and countries. Navigating these regulatory frameworks in Pakistan is particularly complex, involving clear regulations that maintain a balance between innovation and safety. Key challenges include:

Procurement: Procurement is a significant challenge due to the involvement of multiple organizations and a time-intensive process. For example, academic institutes or PSDP-funded projects like the National Center in Big Data and Cloud Computing (NCBC) initially submit the request to the Higher Education Commission (HEC). The HEC then forwards the request to the Ministry of Defense (MOD), which is

responsible for further processing regarding NOC.

Flight operation NOC: Currently, it is mandatory to obtain permission prior to each aerial survey. However, in the domain of agricultural research, particularly when monitoring specific crops, it is essential to conduct observations at least once per week, and in many cases, twice weekly. This frequency is crucial for tracking crop growth, detecting nutrient deficiencies, identifying pest infestations, assessing drought stress, and evaluating lodging resulting from wind or other weather-related phenomena.

Professional Drone Certification: Imported drones currently lack registration and certification, leading to unauthorized use and unmonitored operations. Establishing certification requirements is essential to ensure operational standards are met.

Pilot License Certification: Drone pilots often lack professional competence in critical areas such as aviation regulations, human performance limitations, operational procedures, and technical and operational mitigations for ground and aerial risk management. Their knowledge is also lacking in pre-flight, in-flight, and post-flight procedural protocols. A dedicated training center is needed to provide comprehensive instruction and certification.

To solve these problems the solution and future policy are to implement a unified framework to issue general permissions for agricultural drones to government bodies, academic institutions, and reputable companies registered with the Securities and Exchange Commission of Pakistan (SECP). Rather than mandating separate NOCs for each procedural stage, a single NOC could be issued to a designated department to oversee UAVs for both research, development (R&D), and commercial purposes. This approach aims to streamline procurement procedures and reduce bureaucratic delays. Develop a web portal for organizations to allow organizations and academic institutions to apply for and secure the necessary permissions for each flight. To streamline the process and ensure compliance with regulations, certain guidelines could be established, such as restricting flight altitudes to a maximum of 80 to 100 feet and prohibiting flights over sensitive areas. Furthermore, it would be beneficial to require companies to submit post-flight logs, thereby enhancing transparency and accountability in the monitoring process, such as CAAC providing the regulation and policy based on a person's ID number, passport number, or mobile number. Introduce certification based on drone size and weight. For example, the French government⁴⁸ designates any drone weighing over 800 grams as a professional drone. All such

All such drones are registered with the AlphaTango portal, which assigns them an identification number valid for five years. This registration process ensures that the drone meets the necessary operational standards and is authorized for flight. Establish a training center to provide comprehensive instruction encompassing all essential aspects of drone operation and safety. Upon successful completion of the rigorous training program, pilots would be awarded a certification validating their proficiency and adherence to professional standards for drone flight, such as the FAA provides certificates to individuals based on the oral and practical pilot tests.

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⁴⁸<https://drone-geofencing.com/drone-regulations-certification-and-constraints/>

