



BUSINESS VIABILITY OF PESTICIDE SPRAYING DRONE IN KUTTANAD PADDY FIELDS

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ABSTRACT

Agriculture has always been a major source of income in India. There are a lot of factors that affect the growth and quality of the crop. This includes natural factors such as climate and also some which can be controlled by farmers which are pests and diseases. These can be controlled by pesticides and insecticides which are harmful to farmers. The use of drones in this field can be seen effectively from the past decade. For enhancing agricultural output, precision agriculture has seen far too many advancements in the modern period. Drones can quickly evaluate a field to ascertain the amount of pesticide that the crop needs, making it simpler for farmers to assess their input requirements and predict crop size. The activities follow a precision farming protocol that ensures increased production while lowering input costs.

KEYWORDS: *Kuttanad, pesticide, drone, business*

INTRODUCTION

Paddy Cultivation in Kuttanad

In Kerala, KUTTANAD is a significant rice-producing region, and is known as “The Rice Bowl of Kerala”. Regionally, Kuttanad's paddy fields are referred to as Puncha Vayal. It is the only area in which sub-sea level paddy farming is done which covers Alappuzha, Kottayam and Pathanamthitta districts. The majority of the residents depend on paddy cultivation for a living. Kuttanad has two paddy crop seasons. The first, known as virippu, begins in April and ends in September. The second, known as puncha or rabi season, begins in October and lasts till the end of March.

A drone is an aircraft without any human pilot or passengers on board. It only has a ground-based controller. Autonomous UAVs use software-controlled flight plans to complete tasks and fly home. An agricultural drone is used in pesticide spraying, crop growth monitoring and crop production (2016).

The use of unmanned aerial spray systems has a very potential benefit when compared to backpack spraying, which is the reduction in applicator exposure. The number of semi-autonomous drones is increasing day by day for agricultural spraying, but the aim is for a fully autonomous drone.

The two parts of an unmanned aerial pesticide spraying system are the quadcopter and the spraying mechanism. The most commonly used Quadcopter parts are the following:

Flight Controller Board (FCB): The quadcopter FCB controls the altitude and holds it at the same altitude, it controls stability by using sensors like an accelerometer and gyroscope. In autonomous drones, FCB compares GPS parameters as it navigates the drone in the given path.

Frame: The two main parts of the drone frame are the body and the arms. It protects and houses all electronic components.

LiPo Battery: Lithium polymer batteries are among the most common battery types used for drones because they offer the advantage of high energy density in comparison to their size and weight, with a higher voltage per cell.

BLDC Motor: They are synchronous motors powered by DC electricity via an inverter or switching power supply which produces an AC electric current to drive each phase of the motor via a closed-loop controller. The controller provides pulses of current to the motor windings that control the speed and torque of the motor (2018).

Electronic Speed Controller (ESC) + power distributor: It is an electronic circuit which is used to control the speed of the servo-motor, its direction and possibly also to act as a dynamic brake. ESCs are often used on motors, essentially providing an electronically-generated three-phase electric power low voltage source of energy for the motor. It also allows much smoother and more precise variation of motor speed in a far more efficient manner than the mechanical type with a resistive coil and moving arm once in common use (2018).

Propeller: Propellers are devices that transform rotary motion into linear thrust. Drone propellers provide lift for the aircraft by spinning and creating an airflow, which results in a pressure difference between the top



and bottom surfaces of the propeller. This accelerates a mass of air in one direction, providing lift which counteracts the force of gravity.

Receiver: Often a standard r/c radio receiver unit. The minimum number of channels needed to control a quad is 4, but 5 is usually recommended.

Camera: GoPro or another compact high-definition video unit with onboard storage. Real-time streaming is possible on the latest drones

Is The Drone Business Viable?

Farming is a large-scale activity and regular check-in of crop health is required. This is done manually and it takes a couple of days. When done manually there is always a chance of error. This same task can be done with the use of drones in a matter of hours. Drones equipped with infrared mapping can gather information not only about the health of the soil but also about the plant.

These drones can also check the moisture content in the soil, soil conditions, fertility of the soil, etc. Using drones for plantation is also an upcoming area of interest as the seeds planted by farmers or huge tractors can now be done by budget-friendly drones and the emission of harmful gases and environmental pollution can be limited to an extent.

It can also improve the health of farmers who are currently facing health problems because of spraying pesticides, insecticides, and other chemicals. Pest is always going to be a problem for farmers and spraying pesticides is going to be very harmful to the farmers who are currently doing this job. Spraying pesticides with drones not only is a safer way to spray crops, but farmers will also save a lot of time as doing it manually is very time-consuming. Studies show that the exposure to the operator is if residues are transferred to the human body during the spraying from the contact with the unmanned aerial spraying system (UASS). The UASS has the highest residues on the spray boom and arms and these are the ones by which the operator may lift the UASS. But by wearing proper gloves and protection these transfers could be reduced.

RESEARCH METHODOLOGY

A list of drone parts and their current cost along with GST is made available in the following table after communicating with a drone manufacturer.

AGRICULTURE DRONE PARTS AND PRICING

Sl. No.	Item	Amount + GST
1	1*10 litre drone (drone + transmitter)	3,00,000
2	2 Batteries of 16000mah 1×2way 6s Li-po Battery Charger of 1080W Capacity 1×Tool Kit Includes Certification & UIN	40,000
3	8×16000 mah battery	1,60,000
4	1×2way 6s Li-po Battery Charger of 1080W Capacity	20,000
5	3 Pair Propeller	6,000
6	Spare Nozzles and filters	9,000
7	Aluminium Structure	15,000
8	One-year full coverage insurance	50,000
9	Delivery	Free

The total project cost, cost of the drone, is found to be Rs. 6 lakhs + GST

MEANS OF FINANCE

SL. No.	Particulars	Amount (Rupees in Lakhs)
2	Subsidy for FPOs	5.25
3	Bank loan	1.75
	Total (Rs.)	7

* 75% subsidy is available for farmers producers organisations



When contacted by current pesticide spraying workers, it was understood that a drone could spray pesticides on crops in a one-acre field in ten minutes. It was also informed that the cost of spraying an acre of land is under Rs 750.

INCOME AND EXPENDITURE

Particulars	Amount (Rupees in Lakhs) Year ending March 31 st				
	Year-1	Year-2	Year-3	Year-4	Year-5
INCOME					
Service fee for pesticide spraying <i>Rs. 750 fees charged per acre. 2000 acres are covered. Every year, there are two crop seasons. 4% increase in service charges annually</i>	30	31.2	32.4	33.7	35
TOTAL INCOME (A)	30	31.2	32.4	33.7	35
EXPENSES					
Salary for drone pilots and workers	15	15.75	16.5	17.5	18.25
Battery, electricity	1	1.25	1.25	1.5	1.5
Drone maintenance	1	1.25	1.25	1.5	1.5
Depreciation	3.20	1.92	1.15	0.69	0.41
Loan interest and bank charges	0.50	0.42	0.33	0.23	0.12
TOTAL EXPENSES (B)	20.70	20.59	20.48	21.42	21.78
Profit before tax	9.3	10.61	11.92	12.28	13.22
Income tax	2.04	3.03	3.43	3.53	3.82
Profit after Tax	7.26	7.58	8.49	8.75	9.4
Distribution of Profit (50%)	3.63	3.79	4.245	4.375	4.7
Profit transfer to balance sheet	3.63	3.79	4.245	4.375	4.7

BANK LOAN

SL. NO.	PARTICULARS	AMOUNT (RUPEES IN LAKHS)
1	Term Loan	1.75
2	Working Capital Loan	2
3	Total Loan	3.75

Interest rate: 6%

Duration: 5 years

LOAN REPAYMENT

YEAR	OPENING BALANCE	EMI	INTEREST PAID YEARLY	PRINCIPLE PAID YEARLY	CLOSING BALANCE
1	375000	7520	20696	66301	308699
2	308699	7520	16607	70391	238308
3	238308	7520	12266	74732	163576
4	163576	7520	7656	79341	84235
5	84235	7520	2763	84235	0

Kuttanad farmers were contacted and the major problem they faced was in finding pesticide spraying workers. This has led to a decrease in the productivity of their paddy fields. When a drone is implemented, that single drone can take care of crop monitoring, pest control, soil nutrient management, and can predict weather glitches and floods.



India's Drone Piloting Rules and Regulations

For all drones above Nano-drones (weight including payload above 250 g), getting a Unique Identification Number (UIN) is compulsory. The Director General Civil Aviation (DGCA) Remote Piloted Aircraft Systems (RPAS) Guidance Manual¹⁷ provides guidelines for obtaining UIN for all types of RPAS.

The operation of drones in India is governed by the Unmanned Aircraft System (UAS) Rules¹⁸ Part VI, published on June 2, 2020. The UAS rules require

- For piloting, it requires obtaining an unmanned aircraft operators permit.
- For No Permission, No Takeoff (NPNT) compliance, permission for each flight through an online digital sky platform is required.
- It prohibits carriage of any payload as specified by the Director General for RPAS, thus restricting spraying and pod planting applications to Model Remotely Piloted Aircraft System (MRPAS) used for educational or experimental purposes only.
- It prohibits beyond Visual Line of Sight Operation (BVLOS), thus restricting autonomous operations for better work productivity within the unaided line of sight of the authorised UAS operator.

Some of the important laws for using drones are: Densely populated areas or large crowds must be avoided; the privacy of others should not be breached. Five km from airports or in areas where aircraft are operating, UAVs are out of bounds for UAVs. Flying during the night hours is prohibited. Use of drones or camera drones is prohibited in sensitive areas, including government or military facilities. Drone users must be trained drone pilots and should have attained the age of 18 years. Licence plates indicating the details of the operator and how to contact them must be placed on the drone. Visual line of sight should be maintained while using RPAS. One person can't fly more than one UAV at the same time. The area within 50 km of the country's border is prohibited for drone flying. Flying drones more than 500 metres into the sea from the coastline is banned. Flying over national parks or wildlife sanctuaries is also prohibited. All drones must have a valid third-party insurance policy to cover the liability that may arise on account of a mishap (2021).

CONCLUSIONS AND RECOMMENDATIONS

The paper contains an agricultural pesticide spraying drone for Kuttanad taluk. The current methods these farmers use, backpack spraying, are very harmful to their health. These unmanned aerial sprayers will improve their health conditions.

One of the main problems to be solved is the selection of pilots. The farm labourers who were manually spraying pesticides will now lose their jobs after the introduction of unmanned aerial spraying systems. The companies that provide these drones also provide them with pilots and co-pilots for this task, and these people have to be paid. What we are focusing on is how these people who were previously doing this job should not become unemployed. Giving drone pilot training to these people will not only improve their working lifestyle and so their health. There are a lot of schemes to support the farmers which are provided by the government, like the Agri Infra Fund (AIF), which is trying to facilitate loans of up to Rs. 1 lakh crore into the agriculture sector. The Union Ministry of Agriculture and Farmers Welfare has issued Sub-Mission on Agriculture Mechanisation (SMAM) guidelines that provide up to 100% of the cost of an agriculture drone or Rs. 10 lakhs, whichever is less.

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