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Village hatchery unit: A successful model

for sustainable poultry farming

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The Village Hatchery Unit (VHU) model is a sustainable approach to poultry farming developed under the Farmer FIRST Programme. It addresses the challenge of limited access to healthy chicks for small-scale and backyard farmers by providing village-based hatchery solutions. These VHUs empower local farmers and women's self-help groups to hatch chicks at the community level, thereby reducing reliance on industrial hatcheries. VHUs foster self-sufficiency and support local economies, promoting sustainable practices in rural poultry farming. The model leverages automated incubators, proper hatchery management, and community-driven initiatives, ensuring the timely availability of quality chicks and enhancing local poultry production. This sustainable model is a practical and profitable solution, encouraging ecological balance, economic viability, and social equity in rural poultry farming.

Keywords: Community-based, Farmer FIRST, Poultry, Rural, Small-scale, Sustainable, Village hatchery unit

SUSTAINABLE poultry farming approach prioritizes long-term ecological balance, economic viability, and social equity. The poultry business is heavily dependent on the availability of healthy chicks. However, non-availability of healthy chicks on time significantly impacts farming, particularly for small-scale farmers who rear backyard poultry and country breeds. Most industrial hatcheries prioritize supplying chicks to commercial farmers for large-scale operations, leaving small-scale and backyard farmers at a disadvantage.

To overcome this issue, small-scale Village Hatchery Units (VHUs) are extremely beneficial. These units help ensure that healthy chicks are available at the village level on time. VHUs empower local farmers by providing them with the resources and knowledge to hatch their own chicks, reducing their reliance on industrial hatcheries and enhancing the sustainability of small-scale poultry farming. Most Kadaknath, duck, quail, and desi chicken farmers depend on chicks from outside sources, which comes with several issues such as high mortality rates, high cost of chicks and unreliable supply. Furthermore, this initiative can be operated and managed by Women's Self-Help Groups (SHGs) and farmers' groups at the village level on a community basis. By empowering local women and farmers to run these small-scale VHUs, the initiative fosters community involvement and collaboration. These locally managed hatcheries can provide timely access to healthy chicks, not only to the operators but also to nearby farmers. This community-driven approach enhances the self-sufficiency of rural areas, supports local economies, and promotes sustainable poultry farming practices.

Types of hatchery units

Hatcher-cum-Setter: This type of unit combines both the setting and hatching processes in a single machine, making it convenient for small-scale operations.

Separate setter and hatcher: In this setup, the setter incubates the eggs initially, and the hatcher completes the process. This type allows for more control and efficiency, especially for larger operations.

Both types of hatchery units are suitable for village-level hatchery units. The choice between them depends on your specific requirements and capacity.

Operating a hatchery unit

Incubation: Hatching eggs refers to the production

How to establish a village hatchery unit?

In today's technology era, high-quality and fully automatic hatchery machines (incubators) are readily available in the market, which can be easily operated by farm women and rural farmers with some initial training. These incubators come in various capacities, ranging from 50 to 10,000 eggs. All the hatcheries are suitable for different types of eggs such as Kadaknath, desi hens, ducks, and quail. The main difference lies in the type of egg tray and incubation period for each type of egg. The essential requirement for the establishment of the hatchery unit is proper clean space, consistent power supply, and a reliable source of fresh fertile eggs and space for brooding.

Eggs shifted from setter to hatcher

Shifting the chicks from hatcher to brooder

of baby chicks. To sustain poultry farming, hatchery operations are a crucial component as many poultry breeds do not naturally hatch their eggs in sufficient numbers. The key factors necessary for successful incubation are temperature, humidity, gaseous environment, and egg turning. Maintaining an optimal and uniform temperature inside the incubator is essential for satisfactory results. The incubator temperature should be kept as recommended by the manufacturer, typically ranging from 99.5-100.5°F (37.2-37.8°C) for forced draft-type incubators and about 1°F higher for still-air incubators. Lower temperatures slow down embryo development, while higher temperatures accelerate it. Prolonged abnormal temperatures can adversely affect hatchability by increasing embryonic mortality and producing weak or deformed chicks.

Humidity in the incubator also impacts hatchability. Dry and wet bulb thermometers are used to measure humidity. For poultry eggs, which take ~ 21 days to hatch, the relative humidity should be ~ 60% during the first 18 days and 70% during the last 3 days for optimal hatchability. In forced draft-type incubators, the temperature requirement decreases as humidity increases.

Eggs should be loaded into the incubator with the broad end up. Hatchability decreases when eggs are placed with the narrow end up because the embryo develops with its head in the small end. Turning the eggs in the incubator improves hatchability. Eggs should be turned at least 4 times a day if done manually. Modern incubators are equipped with automatic turning devices that turn the eggs at least 8 times or more within 24 hours. The egg trays turn through an angle of 90°. No turning is required after 18 days of incubation. Using a separate hatcher improves hatchability by maintaining a temperature of about 98°F and a relative humidity of 70 to 80% during the last few days. Separate hatchers also facilitate cleaning, disinfection, and fumigation without disturbing other eggs.

***Testing of incubated eggs*:** Candling is used to test incubated eggs from the fifth to seventh days to remove infertile eggs and again on the 18th day to remove dead embryos. While infertile eggs or eggs with dead embryos do not serve any purpose, removing them makes space available for setting more eggs. In most commercial hatcheries, candling is done on the 17th or 18th day to save labour. Depending on the light passage through the egg, they are classified as infertile (transparent), dead germ (translucent), or live embryos (opaque). Only eggs with live embryos are transferred to the hatcher.

***Hatchery management*:** Before the start of the hatching season, incubators and hatchers should be thoroughly checked for functionality and any defects should be rectified. They must be cleaned, disinfected, and fumigated to kill disease organisms. Fumigation is usually done with formaldehyde gas using 40 mL of 40% commercial formalin and 20 g of potassium permanganate for each 2.8 m^3 of space inside the incubator or hatcher. Potassium permanganate is placed in a glass or earthenware container, and formalin is poured over it. Fumigation should be done at the end of the working day, and the rooms should be closed overnight. It is good practice to start the incubator and hatcher at least 24 hours before setting the eggs to ensure a constant temperature.

Personnel working in the hatchery should use showers, and change clothes and shoes before entering to maintain hygiene. The receipt of eggs from the farm and the delivery of chicks should be managed separately to reduce infection risks. In areas with unreliable electricity, a standby generator is recommended to ensure a continuous power supply, as incubators must operate 24/7 during the incubation period. By establishing a properly managed village hatchery unit with a suitable incubator, proper facilities, and trained personnel, poultry farmers can achieve a sustainable and efficient hatching process, thereby supporting the overall growth and productivity of their poultry farming operations.

Care and management of chicks

Brooding of chicks

For poultry farming, artificial brooding is essential. Here are steps to set up an effective brooding system.

Brooder house preparation: Disinfect the brooder house before introducing chicks. Create a brooding area using cardboard, plastic, or steel sheets, forming a circle with a 6-foot diameter and 16-inch height. Cover the floor with several inches of dry rice husk or newspaper. Ensure the area is protected from direct sunlight.

Heating: For every 100 chicks, use 250W infrared lamps to keep them warm. Divide the lamps so each brooding

Table 1. Incubation period for different types of poultry eggs

Bird	Incubation period (Days)
Chicken	21
Duck	
Mallard/Domestic Ducks	28
Muscovy Ducks	35
Quail	
Japanese Quail	16-18
Bobwhite Quail	23-24
Turkey	28
Goose	28-35 (depending on species)
Guinea fowl	26-28
Pigeon	17-19
Ostrich	42

house has one light bulb. Avoid heating the entire room; focus on the brooding area where the chicks are.

Space requirements: Each chick (1-8 days old) requires 6-7 inches of free space in the brooding house. Provide feed and water immediately upon the chicks' arrival using small drinkers and feeders.

Temperature and lighting: Maintain an optimum temperature of 95°F in the first week, reducing it by 5°F per week until reaching 70°F by the sixth week. Two-watt heat is needed per chick upto 6 weeks. Provide continuous light for at least 48 hrs initially, then 10-12 hrs during the growing stage (8-18 weeks). For laying periods, reduce light to 15-16 hrs. Use chick guards (15-18 inches high) placed 3 feet away from the heat source to prevent direct contact.

By following these guidelines, farmers can effectively manage and care for their poultry chicks, ensuring healthy growth and reducing mortality rates.

Economics of the hatchery unit

Establishing a hatchery unit with a capacity of 1,000 eggs involves various costs, including the purchase of equipment, operational expenses, and maintenance.

Table 1 provides a detailed overview of the costs, revenues, and profitability associated with establishing and operating a 1,000 egg capacity hatchery unit.

Key precautions for establishing and operating hatchery units

Site selection and infrastructure

- *Location*: Choose a well-ventilated, dry, and easily accessible location for the hatchery. Avoid areas prone to flooding or extreme temperatures.
- *Room size*: Ensure the room is adequately sized for the capacity of the incubators. For a 1,000 egg capacity unit, a room size of approximately 10×10 feet is usually sufficient.
- *Ventilation*: Proper ventilation is essential to maintain air quality, and regulate temperature and humidity. Install fans and air vents to ensure good airflow.
- *Power supply*: Provide an uninterrupted power supply with backup options (inverters or generators) to ensure continuous operation of incubators.

Equipment handling and maintenance

- *Selection of incubators*: Choose reliable, energy-efficient incubators suited to your egg types and capacity. Consider both setter and hatcher units, or combined units, based on your needs.
- *Regular calibration*: Calibrate incubators and other equipment according to the manufacturer's specifications. This ensures accurate temperature and humidity control.
- *Cleaning and disinfection*: Regularly clean and disinfect incubators, hatcher units, and all associated equipment to prevent contamination and disease spread.
- *Maintenance schedule*: Implement a routine maintenance schedule to inspect and repair equipment. This includes checking for wear and tear, and ensuring all parts are functioning properly.

Egg handling and incubation

- *Egg quality*: Use only fertile, high-quality eggs from

Vaccination schedule

A proper vaccination schedule is crucial for the health of poultry chicks.

- ***4-5 days***: Ranikhet disease (Newcastle disease) - One drop of F strain in the eye.
- ***8-9 days***: Gumboro (Infectious bronchitis) - One drop of Gumboro live vaccine in the eye.
- ***30 days***: Ranikhet disease - One drop of LaSota in the eye.
- ***50-55 days***: Ranikhet disease - 0.2 mL R2B vaccine intravenously under the wing.
- ***55-60 days***: Fowl pox - 0.2 mL Fowl pox vaccine intravenously under the wing.
- ***Every 3 months***: Ranikhet disease - One drop of LaSota in the eye or drinking water.
- ***Twice a week***: Sharcoferal/Vimeral/Vitagrow liquid - 7 mL per 4 litres of drinking water for 100 chicks.

Brooding the new chicks

Small scale hatchery unit

Table 1. Costs and revenue for operating 1,000 egg capacity hatchery unit

Category	Description	Cost range
Initial setup costs		
Incubator and equipment		
1,000 egg capacity incubator	60,000	60,000
Backup power supply (inverter/UPS)	20,000	20,000
Miscellaneous items (candling light, cleaning supplies)	3,000	3,000
Total		83,000
Recurring rosts		
Egg procurement		
Cost of 1,000 fertile eggs (at ₹ 15 per egg)	15,000	15,000
Utilities and Maintenance		
Electricity (per month)	2,500	2,500
Water and sanitation (per month)	500	500
Maintenance and repairs (per month)	1,000	1,000
Total		4,000
Labour costs		
Monthly salary for 1 operator (per month)	10,000	10,000
Revenue		
Sale of chicks		
Average hatch rate	85%	
Number of chicks hatched per cycle	850	
Selling price per chick (₹)	50	
Revenue per cycle (₹)	42,500	42,500
Cycles per month		
Incubation period for chicks (days)	21	
Number of cycles per month	Approximately 1	
Profitability		
Monthly revenue		
Average revenue per cycle (₹)	42,500	42,500
Total revenue per month (1 cycle)	42,500	42,500
Monthly expenses		
Egg procurement	15,000	15,000
Utilities and maintenance	4,000 (average)	4,000
Labour	10,000	10,000
Monthly profit		
Revenue (₹)	42,500	42,500
Expenses (₹)	29,000	29,000
Profit (₹)		13,500

reliable sources. Ensure eggs are collected, stored, and handled properly to maintain fertility and hatchability.

- *Temperature and humidity*: Maintain optimal temperature and humidity levels as recommended by the incubator manufacturer. Regularly monitor these conditions to prevent deviations.
- *Turning of eggs*: Ensure eggs are turned regularly, either manually or automatically, to promote even embryo development. Avoid turning eggs during the last three days of incubation.

Biosecurity and health management

- *Biosecurity measures*: Implement strict biosecurity practices to prevent disease introduction. This includes sanitizing footwear, equipment, and hands before entering the hatchery.
- *Health monitoring*: Regularly monitor the health of both the eggs and newly hatched chicks. Look for signs of disease or abnormalities and take corrective actions promptly.
- *Vaccination*: Follow a vaccination schedule for chicks to prevent common poultry diseases. Ensure vaccinations are administered correctly and at the recommended ages.

Putting the eggs in hatchery unit (Setter)

Kadaknath farming cum hatchery unit

Training and operation

- *Operator training*: Provide thorough training for hatchery operators on the use of equipment, egg handling, and maintenance procedures. Regular updates on best practices and new technologies are beneficial.
- *Record keeping*: Maintain detailed records of incubation conditions, hatch rates, chick health, and equipment maintenance. This helps in identifying trends and addressing issues promptly.
- *Emergency procedures*: Develop and implement emergency procedures for power outages, equipment failures, and disease outbreaks. Ensure all staff are familiar with these procedures.

Environmental considerations

- *Temperature control*: Ensure the hatchery environment is climate-controlled to prevent extreme temperatures that can affect incubation conditions.
- *Waste management*: Implement effective waste management practices to handle and dispose of waste materials, including egg shells and dead chicks, in an environmentally friendly manner.

By adhering to these precautions, you can establish and operate a hatchery unit that is efficient, reliable, and capable of producing healthy chicks. Proper planning, ongoing maintenance, and adherence to best practices are key to the successful management of a hatchery unit.

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