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Beyond the Field: Using Statistics to Improve Productivity and Profitability in Mushroom Farming

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Mushroom farming needs little land but demands precise control of the growing environment. This article shows how response curves, replicated experiments and efficiency analysis can help growers find optimum settings, compare practices fairly and raise net returns, using simple record keeping as the foundation.

Keywords: mushroom cultivation, response curve, experimental design, profitability, efficiency analysis

Introduction

Mushrooms can be grown in a spare room or shed on agricultural residues such as paddy and wheat straw, which makes them attractive to small and landless households, women's groups and young entrepreneurs. Global production has risen steadily as a result (Royse *et al*., 2017). The same features that make mushrooms easy to start make them delicate to run.

A Crop Controlled by the Room

A mushroom crop is governed almost entirely by the environment inside the growing room. Temperature, humidity, carbon dioxide, light, substrate moisture and spawn quality all influence how many fruiting bodies appear and how good they look (Chang and Miles, 2004). A few degrees of extra heat or one contaminated bag can sharply reduce a cycle's yield, so growers need to know their optimum and its margin of error.

Finding the Optimum

Yield rarely rises forever with a setting. It climbs to an optimum and then falls, a curved relationship that quadratic regression captures well (Figure 1). Comparing strains, substrates and practices needs planned experiments:

1. Allocate treatments to beds or bags at random.
2. Use several replicates of each treatment.
3. Apply analysis of variance and suitable mean comparisons to judge whether differences are real (Gomez and Gomez, 1984).
4. Change one input class at a time and keep batch-wise records (Montgomery, 2017).

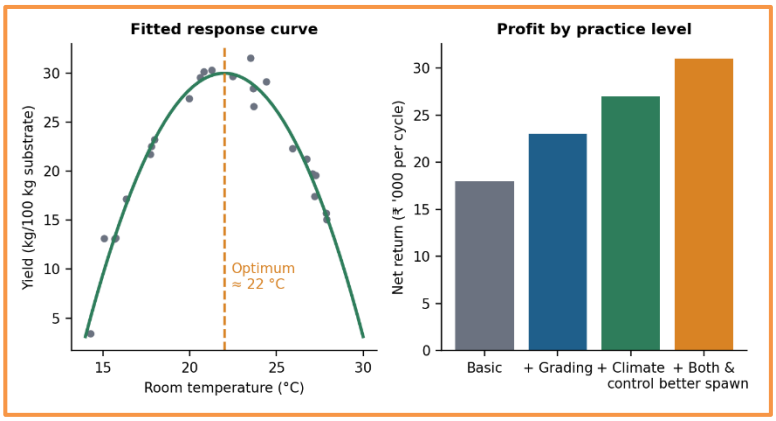

Figure 1: Fitted yield response to room temperature and net returns by level of practice.

From Yield to Profit

Productivity is only half of the business question. Profit depends on cost, price and quality as well as yield, so farm-level analysis should compute net return per cycle and the benefit–cost ratio. Efficiency analysis goes further by asking how much output each farm gets from its inputs and how far it lies from the best practice among comparable farms (Coelli *et al*., 2005). Harvest weight by day reveals the flush pattern and helps plan labour, packing and market visits.

Practical Tips for Growers

Small, steady improvements make the biggest difference in mushroom farming. Growers can:

1. Record room temperature, humidity and yield for every bed or bag.
2. Test a new substrate or spawn on a small number of replicated beds first.
3. Grade mushrooms and note the price obtained for each grade.
4. Calculate net return and benefit-cost ratio after every cycle.
5. Compare notes with other growers to see where their results lag behind the best.

A grower who follows these habits for a year will know the true cost and profit of each cycle, which is the basis of every good decision.

Table 1: Key terms at a glance

Term	Meaning
Biological efficiency	Fresh mushroom weight as a percentage of the dry substrate used.
Benefit-cost ratio	Returns per rupee of cost; a value above one means the cycle made a profit.
Response curve	A fitted relationship between a setting, such as temperature, and yield.
Analysis of variance	A test that separates real treatment effects from chance variation between beds.

Conclusion

Mushroom farming rewards precision. Growers who keep batch-wise records of settings, costs and yields, and let planned comparisons decide what to change, can convert careful observation into a higher and more reliable profit.

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