



Optimizing Performance through Precision Feeding in Poultry

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ABSTRACT

Precision feeding is an advanced approach to poultry nutrition that focuses on delivering the exact amount of nutrients required by each bird or group of birds to optimize their performance. This technique minimizes waste, improves feed efficiency, and enhances overall poultry health and productivity. While there are challenges to implementation, the benefits of precision feeding, particularly when combined with emerging technologies, make it a promising approach for the future of poultry farming.

INTRODUCTION

The poultry sector in India is one of the fastest-growing segments of the country's agriculture and agribusiness industry. The broiler sector is growing at a rate of 8 - 12% and layer sector at 6 – 8% per annum. Poultry sector plays a crucial role in meeting the nutritional needs of the population, providing a significant source of protein through eggs and poultry meat. Feed accounts for 65-70% of broiler and 75-80% of layer production cost. Therefore, availability

of low-priced, high-quality feed is critical for the rapid expansion of the poultry industry. Poultry nutrition research has been focused on determining the availability of nutrients in feed ingredients, understanding the relation between nutrient metabolisms and requirements and formulating least-cost diets to bring nutrient requirements and nutrient supply together (Panda et al., 2016). The overall objective of poultry feeding is to lower the cost of production and to maximize the

economic efficiency. Precision feeding is a powerful tool for optimizing performance in poultry production.

Precision Feeding

Precision feeding means “**feed to match the requirements**”. It is an advanced approach to poultry nutrition that focuses on delivering the exact amount of nutrients required by each bird or group of birds to optimize their performance. This method considers the variations in nutrient requirements due to differences in age, weight, health status, and production goals, thereby enhancing growth rates, feed efficiency, and overall productivity. The aim of precision feeding in poultry is to optimize the efficiency of nutrient utilization as well as to reduce the nutrient load in the manure. Determining the nutrient requirements is a big challenge to the poultry nutritionist as they are influenced by several factors such as genotypes, sex, age, stages of production, stress levels, management conditions, etc. However, the increase in uniformity of genotypes, housing and husbandry practices in the poultry industry due to research advances made it possible to define the nutrient requirements for various classes of poultry.

Advantages of Precision Feeding

- ❖ **Improved Growth and Production:** By meeting the exact nutritional needs, poultry can achieve optimal growth rates and production levels, whether it be for meat or egg production.
- ❖ **Enhanced Feed Efficiency:** Precision feeding reduces feed waste by ensuring that birds receive only what they need. This improves feed conversion ratios (FCR), leading to cost savings.
- ❖ **Better Health and Welfare:** Providing the right nutrients at the right time helps in maintaining the health and welfare of the

birds, reducing the incidence of diseases and improving overall flock uniformity.

- ❖ **Environmental Sustainability:** By optimizing nutrient use, precision feeding can reduce the environmental impact of poultry production, such as lowering nitrogen and phosphorus excretion, which can contribute to environmental pollution.
- ❖ **Economic Gains:** The combination of improved feed efficiency, better health, and optimized production leads to significant economic benefits for poultry producers.

Key Concepts in Precision Feeding

To achieve the goal of precision feeding, several factors need to be considered which are discussed in brief below.

- ❖ **Nutrient requirements** - Understanding the specific nutritional needs of poultry at different stages of growth and production is critical. These needs vary based on factors such as age, breed, health status, and environmental conditions. The nutrient requirement of chicken varies greatly depending for the purpose for which they are reared. Nutrient requirement changes as birds pass through the different phases like starter and finisher phases in broilers, starter, grower and layer phase in both layers and breeders. Today several nutrient requirements standards (NRC, ARC, BIS) are available which can be act as a guideline for formulating feeds for different classes of poultry.
- ❖ **Nutrient composition and ingredient quality**-With the advancement in nutrient analysis and feed evaluation techniques, poultry producers are continuously looking for opportunities that will allow more flexibility in both the types and the levels of feed ingredients for incorporating in poultry feed. Nutrient

composition of feedstuffs provides partly on its nutrient quality. There is a great variation on nutrient availability (amino acids, phosphorus etc.) between feedstuffs. Only one third of plant sources phosphorus is available to the birds and it also varies between feedstuffs. With rapid advancement in feed evaluation technique, data are available on the availability of nutrients from feedstuffs to poultry, particularly on amino acids and phosphorus. The use of digestible amino

acid and available phosphorus content of feedstuffs in feed formulation will make more realistic precision feeding in poultry. Formulating diets based on digestible amino acids make it possible to allow incorporation of range of ingredients and also include alternative ingredients in poultry diets. This will make more precise feed formulation, reduce the feed cost and ensures more realistic bird performance.

Nutrient composition (%) of some common feedstuffs used for poultry feed

Feed ingredients	Crude Protein	Crude Fat	Crude Fibre	Total Ash	ME (kcal/kg)	Lysine	Methionine
Maize	8.18	3.93	1.91	1.21	3414	0.25	0.17
Wheat	12.50	1.98	1.65	1.46	3077	0.34	0.19
Deoiled Rice bran	13.90	1.35	12.75	11.85	1668	0.73	0.32
Soybean meal	45.03	1.62	6.86	6.75	2209	2.74	0.58
Sunflower seed meal	28.0	1.0	26.0	6.8	1800	0.94	0.60
Cotton seed meal	39.87	13.12	14.77	5.50	2650	1.53	0.60
Rape seed meal	37.05	1.03	8.92	7.66	1658	1.74	0.69
Maize gluten meal	61.37	8.30	0.68	2.59	3830	1.06	1.44
Fishmeal	59.28	11.02	----	23.38	3114	3.09	1.20
Meat and bone meal	46.95	18.31	----	29.07	2921	2.15	0.53

❖ **Accurate feed formulation** - The aim of feed formulation is making a balanced diet which provides required quantities of biologically available nutrients. From a commercial point of view another objective is to formulate a balanced diet as least cost. Feed formulation is mathematical calculations to prepare a balanced ration. It requires scientific knowledge and skill in implementing nutrition principles, dietary variables and compatibility, nutrient and dietary interactions, etc. make the formulation more effective to exploit maximum performance. Most of the feed formulation made today is through

computer. Several software packages are available which are well equipped with formulating diets with required concentrations of several nutrients at a time. Least cost and best cost balanced feed can be formulated with high degree of precision in quick time through the use of software.

❖ **Feed formulation based on Ideal Protein Concept** - In broiler chickens, it is always advisable to formulate low protein diets with ideal protein concept to reduce the feed cost (Panda, 2014). In the ideal protein concept, lysine is use as the standard reference amino acid and the requirement

of other amino acids are expressed relative (percentage or ratio) to lysine.

Ideal amino acids ratios for broiler chickens

Amino acids	Pre starter	Starter	Finisher
Lysine	100	100	100
Methionine	41	43	45
Methionine + cysteine	74	78	82
Threonine	66	68	70
Tryptophan	17	17	16
Arginine	105	107	109

*All other amino acids are expressed as percentage of lysine

❖ **Feed Supplements and additives** - Once the nutritional requirements are defined, the next step is to match the needs with combination of various feed ingredients and supplements (minerals, amino acids and vitamins). The advancement in biotechnology has provided new opportunities to enhance the productivity and efficiency of poultry through improved nutrition. Feed formulations in the modern poultry practices also contain a range of feed additives, which are not dietary essential but supplemented in the poultry feed as they have an influence on poultry performance and health. Feed additives are usually supplemented in small quantities and to maintain health status, uniformity and production efficiency in the intensive system of poultry production. Several promising feed additives for the poultry industry such as probiotics, probiotics, emulsifiers, enzymes, phytobiotics, feed acidifiers, etc. are available which can be added to the diet.

❖ **Monitoring and Data Collection:** Precision feeding relies heavily on accurate data collection and monitoring of poultry performance. This includes tracking feed intake, growth rates, and health indicators.

❖ **Feed Delivery Systems:** Advanced feed delivery systems, such as automated feeders, can be used to ensure that each bird receives the right amount of feed. These systems can be adjusted based on real-time data.

❖ **Environmental Control:** Managing the environment, including temperature, humidity, and lighting, can impact feed efficiency and nutrient absorption. Precision feeding often works in tandem with environmental control systems.

Key Challenges

Although precision feeding is the need of hour to optimize the performance in poultry, but there are key challenges for implementing precision feeding in poultry. Some of them are

Initial Costs: The setup of precision feeding systems can be expensive, including the cost of equipment, software, and training.

Data Management: Handling large amounts of data and making real-time adjustments can be challenging. It requires sophisticated software and expertise.

Variability in Nutrient Requirements: Even with precision feeding, variations in nutrient requirements within a flock can make it difficult to achieve perfect optimization.

Technical Expertise: Precision feeding systems require technical knowledge and expertise to operate effectively, which may not be readily available in all regions.

CONCLUSIONS

The objective of feed formulation is to formulate a balanced diet that will provide appropriate quantities of all nutrients required by the bird for optimizing the nutrient utilization efficiency. Precision feeding is a powerful tool for optimizing performance in poultry production. By tailoring nutrition to



the specific needs of each bird or group, producers can achieve significant improvements in growth, feed efficiency, and overall productivity. While there are challenges to implementation, the benefits of precision feeding, particularly when combined with emerging technologies, make it a promising approach for the future of poultry farming.

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