

Poultry waste management in developing countries

Poultry manure characteristics

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INTRODUCTION

Knowledge of the amounts and compositions of manure and litter produced under different poultry production practices is essential for efficient and environmentally responsible management of these by-products as fertilizer, animal feed components or fuel. This knowledge is also required for the effective planning, implementation and operation of a waste management system that is appropriate for the number and type of birds in a given environment.

MANURE QUANTITY

Manure quantity and characteristics are influenced by the species, age, diet and health of the birds and by farm management practices. Estimates of the manure excreted by 1 000 birds per day (based on average daily live weights during the birds' production cycle) are approximately 120 kg for layer chickens, 80 kg for meat chickens, 200 to 350 kg for turkeys (grower females and grower heavy males, respectively), and 150 kg for ducks (Collins *et al.*, 1999; Williams, Barker and Sims, 1999). Extrapolations can be calculated to give general estimates for the number of birds in a given operation.

After excretion, the quantity of manure requiring management depends on factors such as water content, whether the manure is stored in a location where rainfall collects, or whether it is mixed with materials such as straw, wood shavings or rice hulls, as is typical in meat bird housing. Estimates of the litter produced by 1 000 meat birds produced for market range from 1.1 to 2.4 tonnes for chickens, 7.3 to 12.7 tonnes for turkeys (grower females and grower heavy males, respectively), and 3.9 tonnes for ducks (Collins *et al.*, 1999; Williams, Barker and Sims, 1999). Again, extrapolations can be calculated to give general estimates for the number of birds in a given operation. However, these values can be greatly influenced by management practices, such as whether fresh litter is added to existing litter after each growing cycle of birds, or a portion of the manure "cake" is removed from the existing litter prior to adding fresh litter.



Photo Credit: John T. Brake

Good ventilation and manure collection which separates the birds from the manure should promote better bird health and performance

MANURE NUTRIENTS

The scientific literature contains reliable and comprehensive information based on average values from a wide database, on the chemical (nutrient) and physical composition of manures and litter (see the references at the end of this note). Estimates of some environmentally important nutrients in manure are given in Table 1. They can vary according to the composition of ingredients in the birds' feed, and especially if the birds scavenge for all or part of their diet. Although the estimated manure weight as excreted may not vary significantly by bird type, it is essential that specific manure nutrient characteristics and concentrations be determined by reliable sampling and testing.

Manure and litter storage conditions influence some nutrient concentrations; for example, appreciable ammonia may be lost to the atmosphere from manure or litter that is stored in areas exposed to rain or groundwater. Storage in such conditions is not

TABLE 1

Estimates of nutrient contents of chicken manure and litter (kg/tonne manure excreted)

	Nitrogen	Phosphorus (as phosphorus pentoxide)	Copper	Zinc
Layer chicken manure	13.5	10.5	0.01	0.07
Meat chicken manure	13.0	8.0	0.01	0.04
Broiler litter	35.5	34.5	0.26	0.36



Good manure management should also include considerations for bio-security. Preventing contact with birds of differing species and other animals should be a part of good management practices.

environmentally sound, nor is it an efficient way of conserving nitrogen to be utilized for crop growth. The phosphorus content will not change significantly under such increased moisture conditions. To ensure agronomic balance and environmental management that prevent the overapplication of nutrients, it is therefore important to coordinate sampling activities with the timing of land application for maximum crop yields, rather than relying solely on established values or those measured when the manure was in the production house or during early storage. It is also very important to estimate the availability of the crop nutrients in manure or litter (Shaffer, 2009).

MANURE MICROORGANISMS AND VETERINARY PHARMACEUTICALS

Poultry manure and litter contain populations of naturally occurring microorganisms, many of which are environmentally beneficial and play important roles in the ecological nutrient cycles associated with carbon, nitrogen, phosphorus, sulphur and other elements in poultry by-products. However, depending on management and environmental conditions, poultry manure and litter can also contain harmful pathogenic microorganisms that affect human health. Chemical residues in the form of veterinary pharmaceuticals (antibiotics, coccidiostats and larvicides) may also be contained in poultry manure and litter (Sims and Wolf, 1994), depending on diet formulation, management practices and the regulation of poultry production enterprises in a given region. Accurate sampling and laboratory analyses of the harmful microorganisms and chemical residues contained in manure and litter are critical to the implementation of effective mitigation practices.

REFERENCES.

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