Poultry waste management in developing countries

Poultry manure characteristics

Charles Michael Williams, North Carolina State University, Department of Poultry Science, Raleigh NC, United States of America

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). 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.

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 phosphorous content
will not change significantly under such increased moisture condi-
tions. To ensure agronomic balance and environmental manage-
ment that prevent the overapplication of nutrients, it is there-
fore 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 occur-
ring microorganisms, many of which are environmentally ben-
eficial 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 man-
agement and environmental conditions, poultry manure and litter
can also contain harmful pathogenic microorganisms that affect
human health. Chemical residues in the form of veterinary phar-
maceuticals (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. Ac-
curate sampling and laboratory analyses of the harmful microor-
ganisms and chemical residues contained in manure and litter are
critical to the implementation of effective mitigation practices.

REFERENCES.

Poultry waste management handbook; Tables 1-1, 1-2, 1-5, 1-6 and
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