

CONTROL OF ENVIRONMENTAL POLLUTION RELATED TO POULTRY PRODUCTION IN EGYPT

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ABSTRACT

Although poultry provides an economically sound alternative protein source worldwide, negative environmental effects attributable to poultry production in Egypt have not been addressed. The environmental hazard arising from excess nitrogen and phosphorus in poultry waste as well as other contaminants such as drug residues, pathogenic organisms, and viruses (like avian influenza) could be eliminated via nutritional and management interventions, and attention in the media has increased greatly (media@environmentaldefense.org). Soil, water, and air pollution, and transmitted diseases have been reported worldwide and methods of controlling them have been discussed in the literature. Nutrient concentrations, dietary manipulation, and waste management may play an important role in these areas.

Biotechnology may offer interesting tools for improving nutrient utilization and eliminating nutrient waste, while protecting the environment from excess pollutants, including animal wastes. On the other hand, waste management, composting, using manure as fuel though methane production, a soil amendment, fertilizer, a feed ingredient, or enhancing its nutrient content by additives could be also be used effectively.

INTRODUCTION

In Egypt, consumption of red meat alone cannot meet human protein needs, and other protein sources such as dairy products, white meat from poultry, and fish are essential sources for improving living standards and human health. Although, poultry plays an important role in satisfying approximately 40% of animal protein consumption in Egypt, negative effect from poultry production on the environment is well recognized worldwide, but not addressed in Egypt. Thus, regulations for nutrient concentrations in animal manure in areas of intensive animal production are now common issue (www.usda.gov; www.scotland.gov.uk).

Type of contaminants in animal waste:

- 1- Nitrogen excretion in poultry manure (www.usda.gov).
- 2- Minerals and heavy metals P_2O_5 , Na, K_2O , Mg, Mn, Cu, Fe, Zn and S (www.usda.gov; www.scotland.gov.uk).
- 3- Transmitted pathogenic organisms and diseases, e.g., avian influenza (www.fao.org; www.cdc.gov).

Problems related to these pollutants:

Poultry manure has several positive effects when used at recommended levels as a soil amendment and fertilizer (as a source of N, P and K source (Table 1), for increasing organic matter in soils, and improving soil tilth. It can also be used as an animal feed ingredient, and source of fuel through production of methane gas. Excess nitrogen and phosphorus has been shown to contribute to soil and water pollution in areas of intensive animal production. Worldwide use of poultry manure for different purposes has led to contamination of soil, ground and well water and air as well (Blake and Donald, 1992 and Payne and Donald, 1992). The expected nutrients output from poultry manure from the two major classes of poultry are shown in Table 1. It can be concluded from Table 1 that manure can create a serious global environmental problem (www.usda.gov).

Table 1. Nutrient content and approximate manure production of various types of poultry waste (Blake and Donald, 1992 and Payne and Donald, 1992)

Type of manure ¹	Chemical composition ² , %				Manure nutrient content \bird \year (g)				
	N	P ₂ O ₅	K ₂ O	Na	DM	N	P ₂ O ₅	K ₂ O	Na
Broiler	4.88	4.86	3.0	0.6	4890	239	229	129	29.5
Laying hens	4.80	6.73	3.92	0.6	7000	336	471	275	42.0

¹ Manure production varies with bird, ration and season. ² Dry matter basis

Numbers of birds and the amount of nutrients excreted in poultry manure in Egypt are presented in Table 2. These data indicated that there are considerable amounts of nutrients excreted in poultry manure that needed to be utilized more efficiency as a soil amendment, fertilizer, fuel, or animal feed ingredient. In Egypt, nitrogen and phosphorus may represent major pollutants in newly reclaimed areas due to excessive use of poultry manure as a soil fertilizer and/or amendment. This could result in pollution of ground and well water, and consequently pose a human and animal health hazard due to increasing nitrate (a water soluble nitrogen form that does not attach to soil particles like ammonium nitrogen does) levels and bacterial contamination (e.g., *Streptococcus spp.*) of water. Nitrates can cause blue baby-syndrome in infants, and many pose other health hazards. Excessive P in the topsoil can decrease micronutrient availabilities for plants and eutrophication in fish farming, due to overgrowth of algae on the surface of a pond or lake or aquaculture environment.

Heavy metals excreted in poultry and animal manures can build up in the soil, reducing nutrient availability to plants, resulting in higher concentrations in cereals, vegetables, fruits, and animal products, causing related health hazards.

Table 2. Estimated number of birds, manure amount and nutrients contents (Egypt)

Type of birds	N of birds (M)	Manure produced g/b/yr	Amount of nutrient produced annually, tons			
			N	P ₂ O ₅	K ₂ O	Na
Broilers	800	4890	191200	183200	103200	23600
Broiler breeders	5	10500	2520	3533	2058	315
Layers	15	7500	5040	7065	4125	523
Laying breeders	0.25	8140	98	137	80	12.2
Turkeys	2	10860	1060	1056	652	108.6
Waterfowl	20	6500	6344	6318	3900	780
Total	541		206262	201309	114015	26426

Increasing ammonia concentrations in poultry manure in chicken houses can also cause respiratory and eye problems (Wathes, 1998), especially in poorly ventilated poultry houses which is common for poultry production in Egypt. Many other animal health problems and mortality have been shown to occur due to high application rates of poultry wastes on grazing areas, like grass tetany, fescue toxicity, agalactia, fat necrosis, and diseases transmitted by rodents, insects, and humans.

CONCLUSION:

The problems arising from excessive and uncontrolled uses of poultry manure and animal wastes could be controlled by:

1. Land application rates based on nutrient composition of poultry manure, crop requirements, soil type and nutrient content, and manure depletion rate of soil (www.uds.gov and Sharp,2003). Government regulation could be imposed through an agriculture or environmental protection ministry;
2. Application of biotechnology and recent advances in animal nutrition as shown in Table (3) will help to control pollution, reduce feed wastes, improve feed utilization, and decrease costs;

Table 3. Estimated percentage decrease in pollution caused by animal production based on recent technology (Schwarz, 1994)

Factors	Estimated reduction	
	Nitrogen	Phosphorus
Supplements		
Increased used of amino acids and related compounds	20-25	
Cellulase and anti-nutritional factors related enzymes	5	
Phytase		25-30
Growth promoting agents of nature origin	5	5
Systems		
Precise feed formulation to animal needs	10-15	10-15
Phase feeding	10	10
Increased use of highly digestible raw materials	5	5

3. Proper handling and vector control of manure and dead birds;
4. Waste management, composting, methane gas production of manure, soil amendment, or feed ingredient, and enhancing its nutrient content with additives could also be effective.

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