Fall 2000

Avian Advice, Fall 2000

Dale Bumpers College of Agricultural, Food, and Life Sciences (University of Arkansas, Fayetteville). Center of Excellence for Poultry Science

University of Arkansas (System). Cooperative Extension Service

Fall 2000 • Volume 2, Number 1

AVIAN Advice

UNIVERSITY OF ARKANSAS
DIVISION OF AGRICULTURE
COOPERATIVE EXTENSION SERVICE

Arkansas Is Our Campus

INSIDE

Avian Influenza: Always a threat in the fall

Dr. F. Dustan Clark
Extension Poultry Veterinarian

Background and History: Avian Influenza is a disease that can cause extremely high mortality in poultry. Outbreaks have cost the industry many millions to eradicate and the 1994-95 outbreak in Mexico that is still a problem in certain areas of that country. Costs can be devastating to producers since entire flocks can die in only a few hours after infection with a highly virulent strain of Avian Influenza. The costs associated with Avian Influenza outbreaks make it extremely important for the producer to be aware of the signs of the disease and take steps to prevent it.

The disease was first recognized in Italy in 1878 and was first reported in the United States in 1924 in New York City. An outbreak in Pennsylvania in 1983-84 was the most devastating disease outbreak in the recorded history of the U.S. poultry industry. It cost the industry an estimated $60 million to eradicate the disease and consumers about $349 million to replace the table eggs lost in the quarantine region.

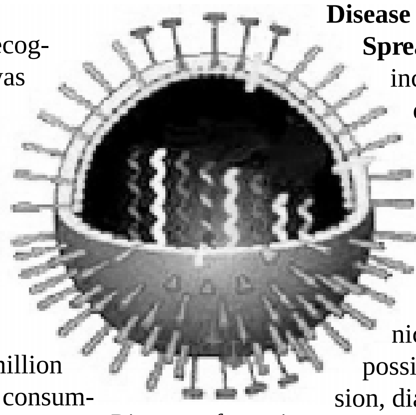


Diagram of an avian influenza particle

Virus Description: The older literature called Avian Influenza "Fowl Plague." A virus called an *Orthomyxovirus* causes Avian Influenza. The virus has two types of glycoproteins that project from the virus coat which may either protect the particle from destruction or allow it to adhere to a surface. These glycoproteins are called Hemmaglutinin (H) and Neuraminidase (N). There are 15 different types of H glycoproteins and nine different types of N glycoproteins. These H and N glycoproteins are used by poultry health professionals to tell one Avian Influenza virus strain from other types, such as H5N2. The viruses are also designated as low pathogenic and high pathogenic based on their ability to cause death in susceptible chickens. Thus you can have a virus designated H5N2 that causes low mortality and is called a low pathogenic type or you could have an H5N2 that causes high mortality and as such is called a high pathogenic type. <u>However,</u> the virus can change from a low pathogenic type to a high pathogenic type without warning.

Disease Symptoms Diagnosis and Spread: Avian Influenza has an incubation period of 3-7 days depending on the virus dose, poultry species infected, route of exposure, and several other factors. The symptoms exhibited by an infected bird are variable and depend on the pathogenicity of the virus. Some of the possible symptoms are: depression, diarrhea, dehydration, appetite loss, weight loss, huddling, a drop in egg production and respiratory symptoms (cough, sneeze, sinusitis). The lesions that could be observed include: a bloody nasal discharge, facial swelling, blue discoloration of the face, subcutaneous hemorrhages, tracheal inflammation, nasal inflammation and hemorrhages on the shanks and in the proventriculus. There is no acceptable or practical treatment for poultry infected with high pathogenic Avian Influenza infected poultry.

Avian Influenza is diagnosed by blood testing and virus isolation. Blood testing is

(continued on page 2)

. . . helping ensure the efficient production of top quality poultry products in Arkansas and beyond.

(Avian Influenza: continued from page 1)

considerably more rapid and less expensive than virus isolation, but virus isolation is much more accurate than blood testing. Poultry found positive for the Avian Influenza virus are currently quarantined and destroyed to prevent spread to other flocks. Destruction of affected animals is the only viable method to control the spread of the disease.

The disease spreads from infected birds to non-infected birds via respiratory and gastrointestinal secretions. Susceptible birds can be exposed to respiratory or gastrointestinal secretions in numerous ways. Secretions can be spread on contaminated footwear, clothing, egg flats, equipment, cages, etc. In fact, Avian Influenza is most often spread from infected to non-infected flocks by people carrying the virus usually on their clothes or footwear. However, the virus can live for short periods on human skin or in human nasal passages. In addition, the virus can be shed by infected wild birds including migratory waterfowl (e.g. ducks and geese) or game birds, which show no clinical signs of the disease. The Avian Influenza virus has also been frequently isolated from clinically normal exotic birds. At moderate temperatures the virus can remain viable in organic materials for long periods of time and can survive indefinitely in frozen materials.

Steps to Prevent the Disease Exposure

1. Keep **"No Visitors"** and/or **"Restricted"** signs posted at the road entrance of the farm.
2. **Do not allow** visitors in the poultry houses or on the farm.
3. **All** farm personnel should wear **separate clothing** (including shoes, boots, hats, gloves, etc.) on the farm. Clothes used on the farm should **stay** on the farm.
4. **Completely change all clothing** after caring for the flock and wash hands and arms thoroughly before leaving the premises.
5. **Do not visit** other poultry farms or flocks or have contact with any other species of birds.
6. Keep all poultry houses securely locked. Lock all houses from the inside while working inside.
7. All equipment, crates, coops, etc., must be **thoroughly cleaned and disinfected** before and after use.
8. **All essential visitors** (owners, feed delivery personnel, poultry catchers and haulers, service men, etc.) are to wear protective outer clothing (coveralls), boots, and headgear prior to being allowed near the poultry flock or farm.
9. **Monitor all vehicles** (service, feed delivery, poultry delivery or removal, etc.) entering the premises to determine if they have been **properly cleaned and disinfected. This includes disinfection of the tires and vehicle undercarriage.**
10. Sick and dying birds should be submitted to a diagnostic laboratory for proper diagnosis of the problem. All commercial growers should contact their flock supervisor and follow their instructions.
11. **Dead birds** are to be **properly disposed** of by burial, incineration or other approved method.
12. Any person handling wild game (especially waterfowl) **must** completely change clothing and shower or bathe before entering the premises.
13. **Do not** borrow equipment, vehicles, etc., from another poultry farm.
14. **<u>Do not visit</u>** areas where Avian Influenza is a problem.

Diagram of Avian Influenza particle was obtained with permission from http://www-micro.msb.le.ac.uk/335/V.html

Tom Tabler ¥ Broiler Unit Manager - Savoy
Center of Excellence for Poultry Science ¥ University ofArkansas

Brooding Chicks in Colder Weather

When brooding chicks, we must always be aware of the fact that the environmental conditions we are sensing about five feet from the floor may be very different than those the chicks are experiencing.

Colder weather means that we, as producers, are faced with some decisions about brooding. A number of studies have shown that birds brooded at 80°F vs. 90°F weighed as much as 20% less at 10 days of age, had 10% higher feed conversion and were far more likely to exhibit symptoms of ascites (water belly) (Figures 1, 2, & 3). Yet brooding chicks means using fuel and fuel costs money. In fact, the fuel bill is usually the highest during colder weather so we spend our fuel dollars wisely.

ARE CHICKS WARM?

TEMPERATURE STRATIFICATION

When brooding chicks, we must always be aware of the fact that the environmental conditions we are sensing about five feet from the floor may be very different than those the chicks are experiencing two inches above the floor. Even though house temperatures appear to be adequate, many times producers notice chicks near the brooding curtain or in other locations throughout the house huddling and appearing to be cold.

This may be because the air three feet above the floor (where the temperature sensor hangs) may be four to seven degrees warmer than at floor level. So you think you are brooding at 86°F, but you may only be brooding at or about 80°F. This is primarily due to the fact that hot air is lighter than cold air so the hot air produced by brooders and furnaces collects at the ceiling while cold air leaking in from various cracks and other locations collects at the floor. The amount of stratification can depend upon how much the heating system is operating, house tightness and location within the house.

continued on page 4

Figure 1. Bird Weight and Brooder Temperature.

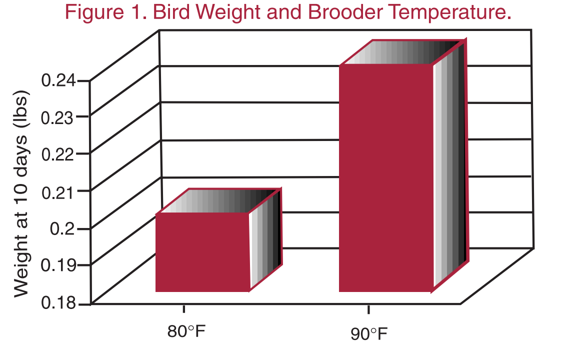


Figure 2. Brooder Temperature and Feed Conversion

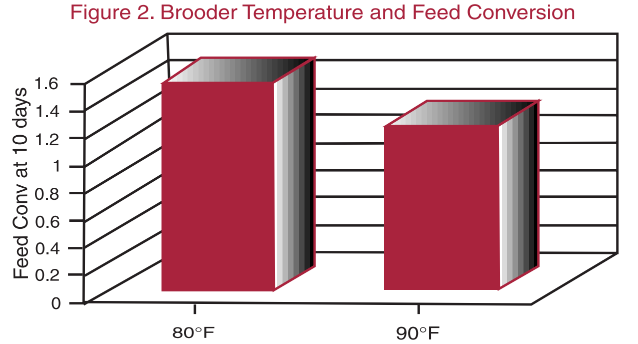
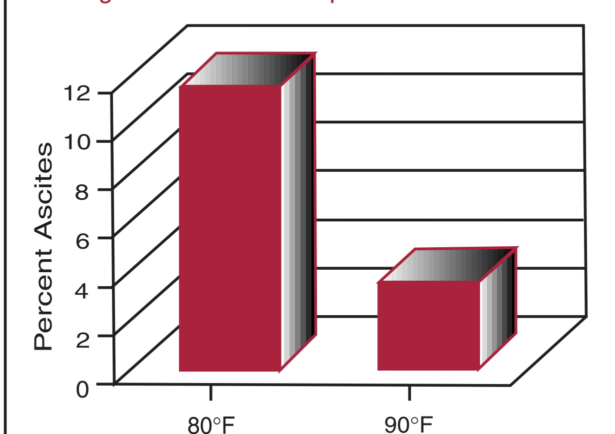


Figure 3. Brooder Temperature and Ascites



PROPER TEMPERATURE SENSOR PLACEMENT *(continued from page 3)*

Temperature stratification is a particularly bad problem with brooder/furnace thermostats since they are placed two to three feet above the floor. If a grower wants a house temperature of about 88°F he/she may set the thermostats, located a few feet above the floor, at 86°F. Stratification and drafts will probably result in a temperature at floor level being at least five degrees cooler. As a result, brooding temperature is actually closer to 80°F than 88°F.

In houses with radiant or conventional brooders the bird is warmed by both hot air and radiant heat emanating from the brooders. So if the air is a little cool in one location, chicks can move toward the brooders to warm themselves. But in houses with forced air furnaces, if the air temperature is too low the only way chicks can keep warm is by huddling because radiant heat is not an option. Obviously, huddling is not a good thing; the more chicks huddle the less they eat, drink and grow.

The best way to ensure that you are brooding at a proper temperature is to place sensors/thermostats three to four inches above the floor with baby chicks. This should be high enough that the chicks cannot reach them. Once the birds are a week to 10 days of age sensors/thermostats can be raised to two feet or so above the floor so the birds cannot peck at them or possibly sit on them. By this time brooders/furnaces are not operating quite as much, so stratification is less of a problem. Also, at older ages the birds are a little less sensitive to lower air temperatures. Moving your sensors will require some degree of extra management on your part but the results should prove beneficial to the health and well-being of the birds.

PROPER GAS PRESSURE

Something else to be aware of as winter approaches is the importance of having proper gas pressure. If you have difficulty maintaining the proper house temperature when you have young chicks and the outside temperature drops into the 20s or less even though your brooders are operating constantly, several possible explanations exist. It could be that your ceiling insulation is inadequate and needs to be increased, your house lets in too much unwanted air or you may be having to ventilate a great deal because there is too much ammonia in the house. However, another possibility is something not considered very often... insufficient gas pressure. Each brooder/furnace is designed to operate most efficiently at a specific gas pressure. When the gas pressure is too low not only do you get insufficient heat, but you may not get complete gas combustion resulting in the production of carbon monoxide. Conversely, if the pressure is too high the brooder could get too hot resulting in reduced life span. It is possible to have too much gas pressure, however, low gas pressure is more common. In general, gas pressure determines the amount of gas that flows to a brooder/furnace. The higher the gas pressure, the greater the amount of fuel burned by the brooder/furnace, and the greater the amount of heat produced. The opposite is also true ... lower pressure, less gas, less heat.

Forced air furnaces require a higher operating pressure than conventional brooders. The University of Arkansas Broiler Research Farm at Savoy has a combination of brooders and forced air furnaces in each of the four houses. The houses are heated by propane with two 1,000-gal storage tanks at each house. When gas pressure begins to drop due to inadequate propane in the tanks, the furnaces at the ends of the gas lines begin to burn inefficiently with a weak yellow flame instead of the normal strong blue flame. If the problem is not remedied by additional gas delivery to the tanks, the rest of the furnaces will eventually start to burn inefficiently followed by the brooders at the ends of the lines and finally the remaining brooders nearest the tanks.

Recent tests of radiant brooders at the University of Georgia have shown that relatively small drops in gas pressure can have a significant effect on the amount of heat radiant brooders produce. Reducing gas pressure from a manufacturers specified 11" of water column (for propane) to 9" reduced radiant heat output from the brooder by approximately 13%. When gas pressure was reduced from 11" to 7" radiant heat output was reduced by 30%. Finally, when gas pressure was reduced from 11" to 5" radiant heat output was reduced by nearly 40%.

It should be obvious that having low gas pressure hurts producers in two ways; it reduces the amount of radiant heat a brooder produces as well as the amount of hot air a brooder/furnace produces, both of which are very important in keeping chicks warm during cold weather. Improper gas pressure not only affects heat output but also gas usage. Furnaces/brooders burn fuel most efficiently when gas pressure is adjusted correctly. Remember that low gas pressure will affect heat output of not only radiant brooders, but conventional brooders and forced air furnaces as well.

If you think that you may have a gas pressure problem check with the manufacturer of the brooder/furnace or your local equipment installer on proper procedure for checking gas pressure as well as information on possible causes of low gas pressure (i.e., proper gas line sizing both inside and outside your house, proper amount of propane in your tanks). Then, if necessary, call your local gas company to set up a time for them to check your gas pressure. The gas pressure needs to be checked at the last brooder/furnace on the gas line with all the brooders/furnaces operating.

SUMMARY AND CONCLUSIONS

With the arrival of fall and the approaching onset of winter try to find some time in your schedule to evaluate such things as your thermostat/sensor locations, gas pressure, tightness and durability of your brooding curtains, and the condition of your side wall curtains. Also, if you do not have stir or mixing fans in your house moving hot air from the ceiling to the chicks, consider getting them. If you have them be sure to use them. Our research shows that stir fans have one of the fastest pay backs of any investment, and the higher the gas prices, the quicker the payback. A thorough evaluation could pay huge dividends in fuel savings and bird performance as we enter another winter season.

Grateful appreciation is extended to Michael Czarick and Michael Lacy, University of Georgia Cooperative Extension Service, for portions of the information contained herein.

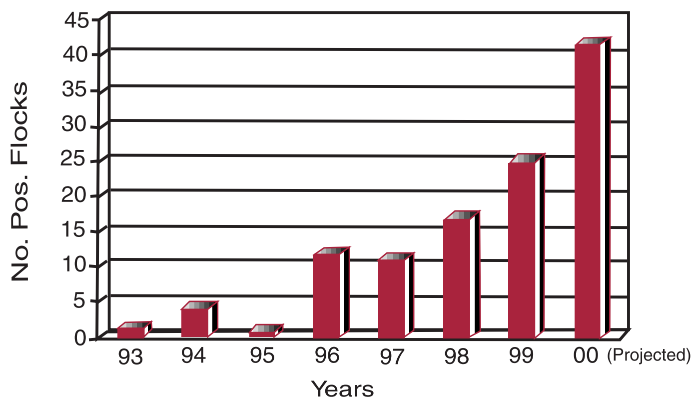
F. Dustan Clark ¥ Extension Poultry Veterinarian
Center of Excellence for Poultry Science ¥ University of Arkansas

Mycoplasmosis -- A Continued Threat

The data in Figure 1 indicate that there has been a continued steady increase in outbreaks of Mycoplasma in Arkansas poultry in the last few years. In fact, if the trend continues, there will be a record number in Arkansas during 2000. The purpose of this article is to discuss symptoms and effects of the disease in poultry, help poultry producers better recognize the disease and prevent the spread of mycoplasmas to other poultry flocks.

Mycoplasma are small bacteria that can cause disease in a variety of poultry species.

Figure 1. Mycoplasma in Arkansas Poultry Flocks



Data collected by the Arkansas Livestock and Poultry Commission

Mycoplasma are small bacteria that can cause disease in a variety of poultry species. There are four species of mycoplasma that affect commercial poultry: *Mycoplasma gallisepticum* (MG), *Mycoplasma synoviae* (MS), *Mycoplasma meleagridis* (MM) and *Mycoplasma iowae* (MI). The first two species (MG and MS) are responsible for the current mycoplasma problems in Arkansas poultry.

Mycoplasma gallisepticum (MG) causes a respiratory disease in chickens and turkeys infecting the sinuses, air sacs, trachea and bronchi of the bird after an incubation period of 1-3 weeks. Chickens with the disease have a cough, eye inflammation (conjunctivitis) and a nasal discharge. A drop in egg production can also be seen in breeders and layers. Turkeys usually have a severe swelling of the sinuses, nasal discharge and frothy eyes. Affected chickens and turkeys do not gain well and may die or be downgraded at slaughter. The disease can be much more severe when birds with mycoplasmosis are also infected by bacteria such as *E. coli* or viruses. The disease is almost always more severe in turkeys than in broilers.

Mycoplasma synoviae (MS) can also cause a respiratory infection. In addition, MS can infect the joints and tendon sheaths of the bird. Chickens infected with MS have reduced growth, swollen joints (hocks) and footpads, and may breast blisters. While air sacculitis (air sac infection) can occur and chickens may show respiratory distress, MS usually does not cause any symptoms when the respiratory tract is infected. Turkeys have similar signs and lesions to broilers, but usually lameness is the most predominant problem. As with MG the problem is more severe when bacteria or viruses also infect the birds.

Several methods are used to diagnose the disease in poultry. The clinical signs and lesions can be used to make a presumptive diagnosis, which is confirmed by isolation of the bacteria, blood testing and/or specialized tests such as the Polymerase Chain Reaction (PCR test) on tracheal swabs.

continued on page 6

Biosecurity steps to prevent the spread of mycoplasms

MYCOPLASMOSIS-- *continued from page 5*

Successful treatment of mycoplasma infections is unpredictable since there is a great deal of variation in the sensitivity of mycoplasma to antibiotics. There are vaccines available for use in MG infections, but since they are live vaccines there is concern that the vaccine strain will spread to other birds. In fact, many states do not allow vaccination for MG or at least restrict vaccine use since most MG vaccine strains have shown a potential to spread to unvaccinated chickens and turkeys. There has been little use of vaccination for MS infections. The preferable method of controlling mycoplasma infections is prevention.

Preventative measures are designed to exclude the bacteria from the flock. One step in excluding mycoplasma from flocks is maintaining clean breeder stock. This is done in the poultry industry by the National Poultry Improvement Plan, which is a testing and control program for egg transmitted diseases such as MG and MS. This program has been extremely successful nationwide and the majority of poultry in the United States are mycoplasma free. Unfortunately, a few problems still arise and as such an increased awareness and biosecurity are needed. Points to remember for better biosecurity are as follows:

1. Restrict visitor access to only necessary visitors.
2. All visitors should wear protective gear (including coveralls, boots or boot covers and headgear) that can be disposed of or disinfected on the farm.
3. Foot dips should be available on each farm at each poultry house.
4. Do not share equipment, egg flats, etc., between farms.
5. Vehicles should be cleaned and disinfected between farms.
6. Wildlife and vermin should be restricted from poultry houses.

Naturally, all points of an on-farm biosecurity program should be reviewed and followed and a good cleaning and disinfection program should be in place to prevent any disease. If mycoplasmosis is suspected in your birds, it is important to immediately contact supervisor/service personnel so a diagnosis can be made and appropriate procedures can be implemented. Prevention is always more economical than treatment and early recognition of a problem can prevent spread of a disease from house to house or farm to farm. ■

Tom Tabler ¥ Broiler Unit Manager - Savoy
Center of Excellence for Poultry Science ¥ University of Arkansas

How Much Litter Do Broilers Produce?

Due to increasing environmental concerns regarding land application of animal wastes and the high replacement cost of new bedding materials, poultry producers are looking more at the option of reusing old litter for an extended period of time. The University of Arkansas Broiler Research Farm at Savoy recently concluded an extended period of reusing old litter in which litter in House 1 was used to produce18 flocks of birds while litter in Houses 2, 3 & 4 each grew 12 flocks of birds without cleanout or topdressing. Caked litter was removed from each house after each flock with a decaking machine. Total loads of caked litter removed were recorded for each house after each flock for future reference. In an effort to document as closely as possible the exact amount of litter produced during this extended reuse period, portable scales were used to weigh each load of litter removed from each broiler house during the total cleanout. Number of loads of dry litter removed as well as total weight removed (in pounds and tons) from each house was then calculated. (Table 1.)

Table 1. Dry Litter Removal from Savoy Broiler Houses

House No.	No. Flocks	Lbs/ House	Tons/ House	Loads/ House
1	18	421,850	210.93	33
2	12	431,440	215.72	38
3	12	315,650	157.83	27
4	12	391,330	195.67	32[1]
ALL		1,560,270	780.15	130

[1]An additional 8,170 lbs (4.09 tons) was removed from House 4 with a farm tractor for use in deep-stacking research.

A private contractor using commercial spreader trucks with 16-ft beds removed 106 loads of litter to predetermined best management sites after each load was weighed. The same contractor removed 24 dump bed loads that were deep-stacked on-site in preparation for additional research. An additional 4.09 tons were also removed from House 4 and added to the deep-stacked litter using a farm tractor. The 106 spreader truckloads averaged 5.78 tons per load. In addition to litter removed at cleanout, weight of caked litter removed since the last cleanout was also estimated for each house (Table 2). These weights were based on an average weight of 3500 pounds per decaker load as determined by portable scales.

Table 2. Estimated Caked Litter Removal Since Last Cleanout

House No.	No. Flocks	Lbs/ House	Tons/ House	Loads/ House
1	18	159,250	79.63	45.5
2	12	147,000	73.50	42.0
3	12	220,500	110.25	63.0
4	12	101,500	50.75	29.0
ALL		628,250	314.13	179.5

In addition to decaking, House 1 also had old litter removed from the non-brood end in October 1999 for an off-site research trial. Based on weights at cleanout, this litter would have equaled approximately 44 tons. The total amount of litter removed from each house since the previous cleanout is indicated in Table 3. This includes original bedding material placed in each house that was not weighed at time of placement, litter removed prior to cleanout and all litter removed during the recent total cleanout. Previous cleanouts were May 1996 for House 1 and October 1997 for Houses 2, 3 & 4. Table 3 also contains the percentage of the litter removed as caked litter as well as the percentage removed as dry litter.

During the summer of 1998, the fogging nozzles in House 3 had worn to the point that they were putting out much more water than the normal 2-gals/hr-flow rating. This caused an excess amount of water to be added to the litter that summer, which was later removed as cake. This is evident in Table 2 by the additional loads of caked litter removed from House 3 and in Table 3 by the increased percentage of caked litter removed from that house. New nozzles were installed in the spring of 1999 preventing any such problem that summer.

continued on page 8

Table 3. Total Litter Removal Since Previous Cleanouts

House No.	No. Flocks	Lbs/ House	Tons/ House	Caked (%)	Dry (%)	Tons/ Flock	Tons/ year[1]
1	18	669,100[2]	334.55[3]	23.80	76.20	18.59	92.95
2	12	578,440	289.22	25.41	74.59	24.10	120.5
3	12	536,150	268.08	41.13	58.87	22.34	111.7
4	12	492,830	246.42	20.60	79.40	20.53	102.7
ALL		2,276,520	1138.27	27.60	72.40	21.07	105.4

[1] Assuming 5 flocks/year
[2] Includes 88,000 lbs of litter removed for a research trial
[3] Includes 44 tons of litter removed for a research trial

A rule of thumb is that each broiler house will generate approximately 100 tons of litter per year. Based on data presented here, that rule appears slightly conservative, but reliable (Table 3). While not cleaning out for an extended period such as this will create some monetary savings where new bedding is concerned, it creates costs in other areas. Therefore, each producer must answer the following questions for him/herself to determine if extended litter usage is a viable option:

A rule of thumb is that each broiler house will generate approximately 100 tons of litter per year.

1) Do I need litter for fertilizer each year or is extended use something I might consider? If pastures and/or hay fields have been receiving chicken litter applications, commercial fertilizer may be necessary as a nutrient replacement. Commercial fertilizer would then be an added cost if litter were reused for an extended period.

2) Will extra ventilation to remove ammonia cost more than having new litter at least once a year? Our observations were that after about a year the ammonia levels reached a plateau. They did not get worse the longer we were on reused litter, but how much better would we have done if we did not have to ventilate for ammonia? During cold weather, ammonia problems caused us to have to pull more air than the birds actually needed in order to get rid of the ammonia. This over ventilation was more expensive than simply pulling in the amount of air the birds needed for respiration.

3) Will extended usage cause increased condemnation problems? We observed a gradual increase in condemnation percentage as the litter got older. Not every flock had a higher condemnation percentage than the previous flock, but the pattern was a steady increase over time. Condemnation percentages the first six months on the litter ranged from .50% to .75%, while the last six months prior to cleanout ranged from 1.35% to 1.87%. Additional factors influence condemnation percentage, but it is likely that the longer a farm goes without a total cleanout, washdown and disinfect program, the greater the disease challenge on that farm. This disease challenge may make it more difficult for subsequent flocks to perform up to their potential. This is especially true if other critical management areas such as environmental quality or biosecurity are compromised.

In conclusion, land application of animal waste will continue to be a sensitive environmental issue in the future. Federal, state and local authorities continue to look at where, when and how much animal waste may be applied to given locations. Producers should be aware of and follow voluntary best management practices developed for their area concerning animal waste application. Questions exist that each individual poultry producer must answer for him/herself when considering reusing old litter for an extended time period. Information presented here should be of value in regards to the amount of litter produced by broiler chickens and may be helpful by pointing out some of what has been observed at the Broiler Research Farm during extended litter usage.

The author gratefully acknowledges Dr. Tom Costello, Biological and Agricultural Engineering Department, Fayetteville, for assistance with data collection and Dr. Karl VanDevender and Paul Ballantyne, Cooperative Extension Service, Little Rock, for use of the portable scales.

Tom Tabler ¥ Broiler Unit Manager -Savoy
Center of Excellence for Poultry Science ¥ University ofArkansas

Savoy Broiler Unit Performance Report

The first flock at the Savoy Broiler Unit was placed on November 19, 1990. The unit contains four 40 x 400 foot broiler houses. Each house contains Cumberland pan feeders, Ziggity nipple waterers and about 1.5 million BTU propane heating capacity for brooding. Each house is equipped with a computer controller, which controls fans, brooders and curtains for temperature control. Houses are also equipped with temperature monitoring equipment (about 80 sensors per house), an electronic water flow monitoring system, weigh bins for feed delivery to the house, sensors for the monitoring of fan run time and devices to determine gas flow from storage tanks.

Houses 1 and 2 were built with steel trusses with R10 insulation in the ceiling while houses 3 and 4 were constructed with wood trusses, R19 ceiling insulation and drop ceilings. Houses 1 and 3 are conventionally ventilated with misters for summer cooling, but 2 and 4 are tunnel ventilated. House 2 contains a "sprinkler" cooling system for summer cooling. The system was developed at the University of Arkansas and uses a landscape sprinkler system to deliver a coarse, cooling mist to the backs of the birds. House 4 uses evaporative cooling pads to cool the inlet air.

Information Key

Variable	Units	Explanation
HSE	No.	House number
FEED CONV	LB/LB	Feed conversion or pounds of feed per pound of gain
HEAD PLACED	No.	Number of chicks place in the house at the beginning of grow-out.
HEAD SOLD	No.	Number of birds sent to the processing plant
LIV	%	Livability or Head sold/Head placed * 100
AGE	D	Age of birds at processing in days
AVE BIRD WT	LBS	Average live bird weight at processing
COND	%	Percentage of birds condemned by the government inspector at the plant. Condemned birds are not fit for human consumption.
FEED COST	$	Feed costs in dollars
CHICK COST	$	Chick costs in dollars
MED COST	$	Medication Costs in dollars
TOTAL COST	$	Total costs in dollars
COST/LB	Cent	Total costs per pound of live bird weight in cents per pount
PAY/LB	Cent	Payment received from the poultry company in cents per pound.
F.A.	$	Fuel allowance-a payment provided by the poultry company to help defray heating fuel costs
GAS USAGE	GAL	Propane usage in gallons
ELECT	KWH	Electrical usage in kilowatt hours

MANAGER'S COMMENTS ON FLOCK 50

House 2, with its unconventional sprinkler cooling system, once again produced the heaviest chicken. This has been the case for most hot weather flocks since this system was installed in 1995. While somewhat different compared to most cooling systems, we have been quite pleased with results we have achieved. House 1 had the best feed conversion and the greatest return and House 2 with the heaviest chicken had the second greatest return. Caked litter removed after the flock was as follows: House 1 – 2 loads, House 2 – 5 loads, House 3 – 3 loads and House 4 – 3 loads. House 2 with its unique sprinkler system did have the most caked litter to remove but not so much as to create problems in the house. The House 2 sprinkler system is capable of putting out much more water than any of our other cooling systems and this fact does appear beneficial to the birds. It does have the potential to create caking problems; however, if managed properly by precisely timing the water output and pulling enough air over the birds, caked litter can be kept in check and the birds continue to eat and gain weight in hot weather.

continued on page 10

PRODUCTION SUMMARY: FLOCK 50 (August 5, 1999 - September 29, 1999)																
HSE (No)	FEED CONV (LB/LB)	HEAD PLACED (No)	SOLD (No)	HEAD LIV (%)	AGE (D)	WT (LB)	AVE BIRD COND (%)	FEED COST ($)	CHICK COST ($)	MED. COST ($)	TOTAL COST ($)	COST/LB (Cent)	PAY/LB (Cent)	F.A.[1] ($)	GAS USAGE (GAL)	ELECT USAGE (KWH)
1	2.08	18109	17384	96.00	55	6.10	1.87[2]	11053	3079	23.60	14155	13.594	3.7813	0.00	264	4167
2	2.13	18309	17296	94.47	55	6.26	1.87	11540	3113	23.60	14676	13.803	3.5727	0.00	168	4456
3	2.16	18409	17302	93.99	55	6.00	1.87	11242	3130	23.60	14395	14.122	3.2533	0.00	99[3]	4460
4	2.11	18409	17474	94.92	55	6.08	1.87	11220	3130	23.60	14373	13.778	3.5974	0.00	209	3463
FARM	2.12	73236	69456	94.84	55.0	6.11	1.87	45054	12450	94.40	57599	13.822	3.5529	0.00	740	16546

1 F.A. = Fuel allowance
2 Condemnation percentage could not be divided by house
3 Lower gas usage and increased electrical usage in House 3 is a reflection of wood pellet furnace

MANAGER'S COMMENTS ON FLOCK 51

House 1 had both the heaviest chicken and best feed conversion. These factors allowed House 1 to also have the greatest return on this flock. The wood burning pellet furnace was once again in use in House 3. This is apparent by the lesser amount of gas usage in that house compared to the other houses. Data collection on the furnace system will now continue until spring 2000. Caked litter removal after the flock sold was as follows: House 1 – 1 load, House 2 – 1 load, House 3 – 1 load and House 4 – 1 load. Litter was quite dry and dusty. As litter depth has increased, fewer loads of caked litter are removed.

PRODUCTION SUMMARY: FLOCK 51 (October 12, 1999 - December 3, 1999)																
HSE (No)	FEED CONV (LB/LB)	HEAD PLACED (No)	SOLD (No)	HEAD LIV (%)	AGE (D)	WT (LB)	AVE BIRD COND (%)	FEED COST ($)	CHICK COST ($)	MED. COST ($)	TOTAL COST ($)	COST/LB (Cent)	PAY/LB (Cent)	F.A.[1] ($)	GAS USAGE (GAL)	ELECT USAGE (KWH)
1	2.03	19631	18318	93.31	52	6.00	1.35[2]	11153	3337	50.70	14541	13.418	4.1961	0.00	1119	1372
2	2.11	19612	18048	92.03	52	5.45	1.35	10348	3334	50.70	13732	14.162	3.4518	0.00	620	1561
3	2.13	19250	18446	95.82	52	5.32	1.35	10459	3272	50.70	13782	14.225	3.3888	0.00	271[3]	3075
4	2.13	18991	18012	94.84	52	5.67	1.35	10870	3228	50.70	14149	14.049	3.5649	0.00	834	1876
FARM	2.10	77484	72824	93.99	52.0	5.61	1.35	42830	13172	202.80	56205	13.949	3.6651	0.00	2844	7884

1 F.A. = Fuel allowance
2 Condemnation percentage could not be divided by house
3 Lower gas usage and increased electrical usage in House 3 is a reflection of wood pellet furnace

MANAGER'S COMMENTS ON FLOCK 52

House 2 had the heaviest chicken, best feed conversion and, in turn, the greatest monetary return. Pellet furnace usage greatly affected gas consumption in House 3. All houses were cleaned out, washed down and disinfected after an extended period of reusing old litter. House 1 grew 18 flocks of birds without cleanout or topdressing. Houses 2, 3 & 4 each grew 12 flocks without cleanout or topdressing. Previous cleanouts were May 1996 for House 1 and October 1997 for Houses 2, 3 & 4. Condemnation percentage has steadily eased upward as litter has gotten older.

PRODUCTION SUMMARY: FLOCK 52 (December 20, 1999 - Feb.7 [House 2] & 8 [Houses 1,3 & 4], 2000)																
HSE (No)	FEED CONV (LB/LB)	HEAD PLACED (No)	SOLD (No)	HEAD LIV (%)	AGE (D)	WT (LB)	AVE BIRD COND (%)	FEED COST ($)	CHICK COST ($)	MED. COST ($)	TOTAL COST ($)	COST/LB (Cent)	PAY/LB (Cent)	F.A.[1] ($)	GAS USAGE (GAL)	ELECT USAGE (KWH)
1	2.08	18806	18027	95.86	50	5.21	1.74[2]	9791	3197	181.29[4]	13169	14.268	3.5247	378	1867	1342
2	1.94	18868	17995	95.37	49	5.75	1.74	10024	3208	181.29	13413	13.198	4.5948	378	1553	2090
3	1.98	18813	17871	94.99	50	5.33	1.74	9425	3198	181.29	12804	13.668	4.1247	378	519[3]	3282
4	2.08	18862	18012	95.49	50	5.18	1.74	9705	3207	181.29	13093	14.290	3.5026	378	2365	2067
FARM	2.02	75349	71905	95.43	49.75	5.37	1.74	38945	12809	725.16	52479	13.838	3.9544	1512	6304	8781

1 F.A. = Fuel allowance
2 Condemnation percentage could not be divided by house
3 Lower gas usage and increased electrical usage in House 3 is a reflection of wood pellet furnace
4 Medication cost includes disinfectant and litter beetle control costs related to cleanout

MANAGER'S COMMENTS ON FLOCK 53

Flock 53 was marked by high mortality as indicated by a livability of only 92.46%. This was due in part to early chick mortality and partially to respiratory problems late in the flock as indicated by a condemnation percentage of 2.63%. This was the first flock after a complete clean out, wash down and disinfection of all houses. Houses 2 & 4 tied for the heaviest weight at 5.62 lbs, however, House 2 had the best feed conversion and the greatest dollar return. Many of the respiratory problems were in House 4 causing it to have a 2.24 feed conversion and the lowest monetary return. Caked litter removed with the decaker after the flock sold was: House 1 - 3 loads, House 2 - 10 loads, House 3 - 5 loads and House 4 - 10 loads.

PRODUCTION SUMMARY: FLOCK 53 (March 13, 2000 - May 3 [House 1, 2 & 3] & 4 [House 4], 2000)

HSE (No)	FEED CONV (LB/LB)	HEAD PLACED (No)	SOLD (No)	HEAD LIV (%)	AGE (D)	WT (LB)	AVE BIRD COND (%)	FEED COST ($)	CHICK COST ($)	MED. COST ($)	TOTAL COST ($)	COST/LB (Cent)	PAY/LB (Cent)	F.A.[1] ($)	GAS USAGE (GAL)	ELECT USAGE (KWH)
1	2.16	19065	17651	92.58	51	5.23	2.63[2]	9988	3241	33.18	13262	14.745	3.5496	000	1290	1687
2	2.12	19111	17844	93.37	51	5.62	2.63	10631	3249	33.18	13913	14.246	4.0489	000	856	1913
3	2.18	19069	17866	93.69	51	5.51	2.63	10740	3242	33.18	14015	14.627	3.6678	000	756[3]	2851
4	2.24	19165	17289	90.21	52	5.62	2.63	10892	3258	33.18	14184	14.989	3.3063	000	1323	1761
FARM	2.18	76410	70650	92.46	51.25	5.50	2.63	42252	12990	132.70	55374	14.647	3.6477	000	4225	8212

1 F.A. = Fuel allowance
2 Condemnation percentage could not be divided by house
3 Lower gas usage and increased electrical usage in House 3 is a reflection of wood pellet furnace

MANAGER'S COMMENTS ON FLOCK 54

Flock 54 was highlighted by the best quality baby chicks we have had in quite some time. The weather caused some major problems as it stayed cool and rainy for the first six weeks of the flock and very hot and dry the last two weeks. Birds were not acclimated to the heat and, as a result, we lost 1003 birds in House 4 (cool cell house) the last seven days of the flock. We are currently discussing possible options involving modifications to House 4. Even with the heat loss, the flock as a whole did quite well. House 3 had the heaviest chicken at 6.30 lbs but House 2 (with its unconventional summer sprinkler system) was close behind with a 6.24 lb bird and a much better feed conversion of 2.08 allowing it to have the greatest return. House 3 made only slightly less money than House 1. House 4, with all its heat loss problems, had the smallest payback, the lightest bird and the highest feed conversion. The unconventional sprinkler system in House 2 used 5,271 gals of water during the flock compared to the cool cell system in House 4 which used 35,510 gals of water. Caked litter removed after the flock was as follows: House 1 - 4 loads, House 2 - 8 loads, House 3 - 10 loads and House 4 - 6 loads. ■

PRODUCTION SUMMARY: FLOCK 54 (May 15 [Houses 1 & 2] 16 [Houses 3 & 4], 2000- July 10 [Houses 1, 2 & 4] & 11 [House 3], 2000)

HSE (No)	FEED CONV (LB/LB)	HEAD PLACED (No)	SOLD (No)	HEAD LIV (%)	AGE (D)	WT (LB)	AVE BIRD COND (%)	FEED COST ($)	CHICK COST ($)	MED. COST ($)	TOTAL COST ($)	COST/LB (Cent)	PAY/LB (Cent)	F.A.[1] ($)	GAS USAGE (GAL)	ELECT USAGE (KWH)
1	2.16	18557	17459	94.08	56	6.05	1.92[2]	11385	3155	45.50	14586	14.083	4.2183	000	218	4868
2	2.08	18891	17905	94.78	56	6.24	1.92	11627	3211	45.50	14884	13.594	4.7081	000	208	4716
3	2.16	19118	18263	95.53	56	6.30	1.92	12451	3250	45.50	15747	13.953	4.3488	000	151[3]	6688
4	2.18	19355	17593	90.90	55	5.77	1.92	11083	3290	45.50	14419	14.488	3.8132	000	344	4516
FARM	2.15	75921	71220	93.81	55.75	6.09	1.92	46547	12906	182.00	59636	14.017	4.2842	000	921	20788

1 F.A. = Fuel allowance
2 Condemnation percentage could not be divided by house
3 Lower gas usage and increased electrical usage in House 3 is a reflection of wood pellet furnace

Tom Costello ¥ Biological andAgricultural Engineering
Department ¥ University ofArkansas

Low-Cost, Temporary Poultry Litter Storage

Most poultry growers realize that dry poultry litter is a valuable by-product of production. Yet applications of poultry litter to hay fields and pasture lands generally supply more phosphorus than the crop can use. To avoid long-term phosphorus buildup in soils and the associated pollution risk, many farmers are seeking off-farm markets for litter. Storage systems are often necessary to provide flexibility in clean-out scheduling and off-farm transport arrangements.

Poultry litter storage systems must be economical for the grower and maintain environmental protection while retaining litter quality. Excessive temperatures during storage (as litter goes through a ‘heat’ cycle similar to composting) can degrade litter quality and lead to safety concerns (spontaneous combustion). Allowing litter to be wetted by rain or runoff can lead to odors, pests, degradation of quality and loss of product. Current environmental regulations in Arkansas also dictate that dry animal manure be stored in a way that keeps it dry and isolated from natural rainfall and runoff. Hence, some method of cover is required unless the farmer has a permit to manage the litter as a liquid waste.

Storage alternatives include permanent structures (e.g., traditional wood frame or pole structure with sheet metal roof) or temporary systems (e.g., outdoor litter pile with tarp cover). Some estimated costs are shown in Table 1. Costs can be spread over the life of the structure, during which litter from several clean-outs may be successfully stored. For example, if the temporary system was put in place for 100 tons of storage capacity, the initial cost would be $450. If the tarp lasted three years and was used three times, then the cost would be $150 per year or $1.50 per ton of litter stored. Reduced costs often make temporary storage techniques more practical when large volumes of litter must be stored for short periods. One objective of on-going work at the U of A has been to configure a covered pile that effectively stores litter, but is inexpensive and easy to construct and maintain.

Table 1. Cost of Litter Storage Alternatives

Construction Type	Life Exp. (years)	Cost ($/ft^2)	Cost ($/ton)
permanent wood structure, steel roof	20+	$6.50	$105
semi-permanent steel tubing structure, polyethylene cover	5 - 10	$3.50	$56
temporary free-standing wind-row, polyethylene cover	2 - 5	$0.30	$4.50

FIELD TESTING

Two low-cost, temporary litter storage systems were constructed and monitored at the University of Arkansas Broiler Research Unit near Savoy, Arkansas, in February, 2000. One pile was a free-standing wind-row of litter (Figure 1) and the other was a bunker built from two rows of large round hay bales (Figure 2). Piles were each covered with a 6 mil polyethylene, 30 ft x 60 ft, plastic tarp (Poly-Tec Hay Tarps[1]).

The free standing wind-row and the round bale bunker method of temporary litter storage appeared equally effective in this trial. While more litter could be stored in the bunker bale method, construction of the bunker required considerable time and expense. Based on our field experience, the free-standing, covered litter pile seems to be the best choice for a grower to temporarily store litter outside for a few weeks or months. The technique is inexpensive, easy to construct, maintains litter quality and protects the environment.

Figure 1. Free-standing wind-row litter storage system with tarp cover. Pile cross-section has dimensions 20 ft. bottom width, 3 ft. top width and 6 ft height. Tarp is 30 ft. wide, 6 mil thick, 3-ply polyethylene. Sandbags placed every 2 to 3 foot along the perimeter hold the tarp down.

Figure 2. Hay bunker litter storage system with tarp cover. Two rows of large round bales were used to form bunker walls. Outside width of bunker is 20 ft. (10 ft. between bales). Litter is piled about 2 ft above the top of the 5-ft diameter bales to a total depth of 7 ft. Same tarp as described in Figure 1. Tarp was originally held down using grommets and ropes every 2 ft (left side of photo) and tires and ropes ever 4 ft (right side of photo). Both of these methods failed during heavy wind. Pile was eventually held successfully using grommets and ropes with sandbags added on top to counteract the lift forces of the wind.

Steps in Implementing Temporary Litter Storage

1. Estimate the Amount of Litter to Move

The quantity of litter removed during full-house clean-out depends directly on the number of flocks of birds that have been grown since the last clean-out. Table 2 gives guidelines for planning temporary systems for storing dry poultry litter from full-house clean-out, based on our tests at Savoy. Our data is based on multi-year re-use of bedding/old litter. Between flocks, no bedding was added and caked-litter was removed. Broilers were grown to an age of 6-8 weeks. To include storage for caked litter removed between flocks, estimate cake litter as an additional 6 tons per 16,000-ft^2 house per flock. All litter weights are on the as-is moisture basis. Table 2 also shows that the average litter depth increases roughly 5/8 inch per flock. Knowing the bulk density of the litter and the depth, the total litter weight and volume in the house can be estimated. These data can then be used to estimate the number of truckloads of litter that will be removed during clean-out and to size the storage structure. The storage structure is assumed to be a free-standing pile, 6 ft tall with a 20 ft bottom width and 3 ft top width.

Example. A broiler farmer has five broiler houses, 40 ft x 400 ft, on a clean-out schedule of once every two years (about 12 flocks). How much litter will be removed and how much storage space will be needed? Refer to Table 2.

- ❒ Litter depth: assume 8 inches
- ❒ House area: equivalent to five 16,000-ft^2 houses
- ❒ Litter weight: 188 tons x 5 = 940 tons total
- ❒ Pile length: 134 ft x 5 = 670 ft

continued on page 14

[1] Poly-Tec Hay Tarps, Walk-Winn Plastics, Little Rock, Arkansas. Mention of a name brand product in no way endorses that product nor implies that other similar products are not appropriate for use.

If the same grower alternated clean-outs so that one house can be cleaned out every five months, then the storage capacity required and the storage costs could be reduced by a factor of 5 (188 tons, 134 ft of storage).

To estimate litter weight, volume and storage requirements for turkeys or cornish hens, at the time of clean-out, measure the litter depth carefully throughout the house and take an average. Choose the closest litter depth from Table 2 and use the estimated litter weights and volumes for that depth. This assumes that the bulk density of the litter will be similar to the broiler litter we monitored at Savoy. This should give a good estimate for planning purposes.

Table 2. Guidelines for Dry Poultry Litter Storage Planning

				Litter Removed (per 16,000 ft^2 house)		Storage Needed (per 16,000 ft^2 house)	
No. of Flocks	Litter Depth (inches)	Bulk Density (lbs/ft^3)	Areal Density (lbs/ft^2)	Total Weight (tons)	Spreader Truck Loads	Total Volume (ft^3)	Length of Pile (ft)
1	1.6	38.5	5.1	31	5	1400	34
2	2.2	39.6	7.3	44	8	1900	42
3	2.8	40.7	9.5	57	10	2500	50
4	3.4	41.8	11.8	71	12	3200	59
5	4.0	42.8	14.3	86	15	3800	69
6	4.6	43.9	16.8	101	18	4500	78
7	5.1	45.0	19.1	115	20	5100	87
8	5.7	46.1	21.9	131	23	5800	98
9	6.3	46.4	24.4	146	25	6500	107
10	6.9	46.4	26.7	160	28	7100	116
11	7.5	46.4	29.0	174	30	7700	125
12	8.1	46.4	31.3	188	33	8400	134

Notes: Based on 6-8 week flocks of broilers. Areal density is the weight of litter in the house per ft^2 of floor area. Weight of litter actually removed is only 75% of the amount estimated to be in the house, due to incomplete clean-out, spillage, experimental error. A spreader truck usually hauls 5.75 tons of litter. The bulk density of litter placed in a pile is about 45 lb/ft^3. The recommended litter pile has cross-sectional dimensions of 20 ft bottom width, 3 ft top width and 6 ft height.

2. Properly Site and Construct the Pile

Locate the storage system close to the poultry houses to minimize travel time during clean-out/construction. Choose a site that is relatively flat (less than 5% slope) on high ground that will not intercept overland flow of rainfall/runoff water from upstream land. Orient the pile with the long axis in the direction of the greatest slope. Be sure that the pile is surrounded by a 100 ft buffer zone of well established grass with no rocky outcrops, creeks, streams, sink holes or other water sources. Avoid building on soils which have excessive leaching capacity or shallow depth. If possible, select a site which is protected from the wind by trees or some other wind-break (this will reduce potential problems with the tarp blowing off).

Unload litter from the truck along the pile centerline. Between truck unloadings, use a front-end loader to move the litter, piling it higher to build the desired cross-section. It should not be necessary to shape the pile with the tractor from the sides. The natural slope of dry litter (about 37°) should form a pile about 20 ft wide when a maximum depth of 6-6.5 ft is attained (deeper piles are at risk for over-heating). More than one pile may be needed, depending upon the total volume of material, the topography of the site and the length of the available tarp.

3. Correctly Cover the Pile

A pile 6 ft tall, 20 ft bottom width and 3 ft top width will require a 30 ft wide tarp. The length of the tarp will, of course, depend on the length of the pile. When determining tarp length, be sure to allow enough tarp length to cover both ends of the pile. Our experience indicates that a tarp thickness of 6 mils with a UV inhibitor will provide a tarp life greater than one year (the manufacturer suggests a five year life if tarp is well maintained). Clear plastic tarps should be avoided to reduce solar heating of the piles. Less expensive plastic sheeting may be used but the material will degrade quickly, will probably need to be disposed of after a single storage period, will tend to rip easily and could fail during extended storage periods.

Recruit several people to help unroll the tarp and place it over the pile. Adjust the tarp so that overlap is equal on both sides of the pile. Have some weights ready along the sides of the pile to hold down the tarp temporarily while it is put into position.We recommend that the tarp be held down using weights along the perimeter. Sandbags placed every 2-3 feet have worked very well in our tests. (Tires are not heavy enough if placed only on the perimeter, they also present a disposal problem at the end of the storage period).With a free-standing pile, grommets/ropes and stakes are not easy to install since there are no sidewalls. Commercial sandbags

A simple system of temporarily storing poultry litter can be used to protect product quality and prevent negative environmental impacts.

(empty) can be purchased or one could get new or used plastic/fiberglass feed sacks. Feed sacks seem to deteriorate quicker than sandbags. Fill partially with sand or soil and tie off with twine. Once in place, the bags will not abrade the tarp. Sandbags are preferred over steel pipe, concrete blocks or other weights that could potentially damage mowing machinery if left in the field.

4. Maintain the Pile

Under normal weather conditions, the covered pile should hold up well, keeping the litter dry and preventing contamination of rain or runoff water. After storm events, check the tarp and readjust as necessary. Pull out any slack (and eliminate any low spots that puddle water) that may have developed from wind action. This will prolong tarp life by reducing abrasion associated with tarp billowing. Re-position sandbags as necessary.

5. Reclaim the Litter

At the end of the storage period, roll back the tarp as needed to uncover a section of the pile. Load the litter onto the trucks for transport off the farm. Re-cover the end of the pile if the next load will be removed at a later date. After the pile has been completely loaded out, gather any residual litter, load into a spreader and land apply locally in a manner approved for land application of dry poultry litter. Carefully fold the dry tarp and store for re-use.

SUMMARY

A simple system of temporarily storing poultry litter can be used to protect product quality and prevent negative environmental impacts. A free-standing litter pile, about 20 ft wide and 6 ft deep, can be covered with a tarp, 30 ft wide, 6 mil thick. Sandbags placed every 2-3 ft along the perimeter will hold the tarp in place. Litter from an annual clean-out of a typical 40 ft x 400 ft broiler house can be stored temporarily in an 80 ft long pile, costing approximately $450 for materials. If the tarp is well maintained, the cost of the system can be spread over several years use and many hundreds of tons of stored litter.

ACKNOWLEDGMENTS

This work was partially supported by an EPA 319h grant through the Arkansas Soil and Water Conservation Commission. Thanks to Tom Tabler, John Cook and Amy Cotter for help in construction and maintenance of litter piles. Students in Biological and Agricultural Engineering 4913 at the University of Arkansas (Spring 2000) contributed to the litter storage designs. Karl VanDevender suggested the idea for this demonstration. Tarps were provided by Walk-Winn Plastics, Little Rock. ■

AVIAN ADVICE

Avian Advice is anewsletter distributed by the Arkansas Cooperative Extension Service. Articles in *Avian Advice* focus on current production issues and provide information on recently completed field trials. If you have a question regarding any of the articles published in this newsletter, please contact Dr. Frank T. Jones at the Center of Excellence for Poultry Science (501) 575-5443 or e-mail ftjones@uark.edu

Avian Advice is published bi-annually.

Avian Advice
c/o The Center of Excellence for Poultry Science
POSC 0-114, Fayetteville, AR 72701

Editor: Dr. Frank T. Jones
Graphic Designer: Karen Eskew

UA Poultry Science Extension Specialists

Write Extension Specialists, except Jerry Wooley, at:
Center of Excellence for Poultry Science
University of Arkansas
Fayetteville, AR 72701

Coming Events

September 12-14, 2000
Arkansas Nutrition Conference, Clarion Hotel, Fayetteville, AR
Contact: The Poultry Federation at (501) 375-8131

September 15-16, 2000
Turkey Symposium, Inn of the Ozarks, Eureka Springs, AR
Contact: The Poultry Federation at (501) 375-8131

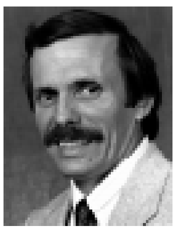
September 20-21, 2000
Poultry Production and Health Seminar, the Sheraton Hotel, Birmingham, AL
Contact: U.S. Poultry & Egg Association at (770) 493-9401

October 6-15, 2000
Arkansas State Fair, State Fair Grounds, Little Rock, AR
Contact: State Fair office at (501) 372-8341

October 16-18, 2000
National Poultry Waste Management Symposium, Fountainbleau Hotel, Ocean City, MD
Contact: Nick Zimmerman at (410) 651-9111 or Rich Reynells at (202) 401-5352

January 17-19, 2001
International Poultry Exposition, Georgia World Congress Center, Atlanta, GA
Contact: U.S. Poultry & Egg Association at (770) 493-9401

Dr. Dustan Clark, Extension Poultry Health Veterinarian, earned his D.V.M. from Texas A&M University. He then practiced in Texas before entering a residency program in avian medicine at the University of California Veterinary School at Davis. After his residency, he returned to Texas A&M University and received his M.S. and Ph.D. Dr. Clark was director of the Utah State University Provo Branch Veterinary Diagnostic Laboratory prior to joining the Poultry Science faculty at the University of Arkansas in 1994. Dr. ClarkÕs research interests include reoviruses, rotaviruses and avian diagnostics. He is also responsible for working with the poultry industry on biosecurity, disease diagnosis, treatment and prevention.
Telephone: 501-575-4375, FAX: 501-575-8775, E-mail: fdclark@uark.edu



Dr. Frank Jones, Extension Section Leader, received his B. S. from the University of Florida and earned his M. S. and Ph.D. degrees from the University of Kentucky. Following completion of his degrees Dr. Jones developed a feed quality assurance extension program which assisted poultry companies with the economical production of high quality feeds at North Carolina State University. His research interests include pre-harvest food safety, poultry feed production, prevention of mycotoxin contamination in poultry feeds and the efficient processing and cooling of commercial eggs. Dr. Jones joined the Center of Excellence in Poultry Science as Extension Section Leader in 1997.
Telephone: 501-575-5443, FAX: 501-575-8775, E-mail: ftjones@uark.edu

Dr. John Marcy, Extension Food Scientist, received his B.S. from the University of Tennessee and his M.S. and Ph.D. from Iowa State University. After graduation, he worked in the poultry industry in production management and quality assurance for Swift & Co. and Jerome Foods and later became Director of Quality Control of Portion-Trol Foods. He was an Assistant Professor/Extension Food Scientist at Virginia Tech prior to joining the Center of Excellence for Poultry Science at the University of Arkansas in 1993. His research interests are poultry processing, meat microbiology and food safety. Dr. Marcy does educational programming with Hazard Analysis and Critical Control Points (HACCP), sanitation and microbiology for processing personnel.
Telephone: 501-575-2211, FAX: 501-575-8775, E-mail: jmarcy@uark.edu

Dr. Susan Watkins, Extension Poultry Specialist, received her B.S., M.S. and Ph.D. from the University of Arkansas. She served as a quality control supervisor and field service person for Mahard Egg Farm in Prosper, Texas, and became an Extension Poultry Specialist in 1996. Dr. Watkins has focused on bird nutrition and management issues. She has worked to identify economical alternative sources of bedding material for the poultry industry and has evaluated litter treatments for improving the environment of the bird. Research areas also include evaluation of feed additives and feed ingredients on the performance of birds. She also is the departmental coordinator of the internship program.
Telephone: 501-575-7902, FAX: 501-575-8775, E-mail: swatkin@uark.edu

Mr. Jerry Wooley, Extension Poultry Specialist, served as a county 4-H agent for Conway County and County Extension Agent Agriculture Community Development Leader in Crawford County before assuming his present position. He has major responsibility in the Arkansas Youth Poultry Program, and helps young people, parents, 4-H leaders, and teachers to become aware of the opportunities in poultry science at the U of A and the integrated poultry industry. He helps compile annual figures of the stateÕs poultry production by counties and serves as the superintendent of poultry at the Arkansas State Fair. Mr. Wooley is chairman of the 4-H Broiler show and the BBQ activity at the annual Arkansas Poultry Festival.
Address: Cooperative Extension Service, 2301 S. University Ave., P.O. Box 391, Little Rock, AR 72203
Telephone: 501-671-2189, FAX: 501-671-2185, E-mail: jwooley@uaex.edu