

# THEPOULTRYSITE DIGITAL.

March 2014

Atlanta Poultry Forum  
Offered New Insights on  
Feed Ingredients and  
Additives

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Split Feeding System for  
More Sustainable Egg  
Production

## Also in this Issue:

Asia Supplies 60 Per Cent of  
World's Eggs

Windrow Composting Broiler  
Litter between Flocks





# Welcome.Editors Note

ThePoultrySite  
Digital

March 2014



Feeding & Nutrition is the theme for this latest issue of *ThePoultrySite Digital*.

Many of the scientific papers presented at the International Poultry Scientific Forum in Atlanta in January were on this topic and we have selected some of the highlights for our first article, including insights into the feeding value of newer feed-stuffs and feed additives, strategies for hot weather and for hens in aviaries and how antibiotics affect the environmental impact of broiler production in the US.

Focusing on layers in the second article, a leading feed company explains how its Split Feeding System delivers the optimal supply of nutrients in order to meet the specific needs of the hen during the egg formation process by supplying two different feeds per day.

Egg production trends in Asia are brought under the spotlight by industry analyst, Terry Evans, in the latest in our series, 'Global Poultry Trends'.

And finally, a look at windrow composting of broiler litter in the house between flocks by Mississippi State University focuses on controlling pathogens and litter moisture as well as avoiding conditions that may exacerbate footpad dermatitis.

## Jackie Linden

Senior Editor

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**Jackie Linden**



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A brown chicken with a red comb is pecking at a metal feeder. The feeder is a cylindrical metal container with a flat top and a shallow base. The chicken is positioned to the left of the feeder, with its head and beak inside the base. The background is a blurred, dark grey wall. The overall scene is a close-up of a chicken in a farm environment.

# Atlanta Poultry Forum Offered New Insights on Feed Ingredients and Additives

Among the 140 papers presented at the International Poultry Scientific Forum in Atlanta in January were those reporting research into a range of feed-related topics, writes Jackie Linden. Included in this article are those offering insights into the feeding value of newer feedstuffs and feed additives, strategies for hot weather and for hens in aviaries and how antibiotics affect the environmental impact of broiler production in the US.



## **Broiler Growth More Affected by DDGS Inclusion Level Than Oil Content**

New data from an experiment at Auburn University suggests that increased inclusion rate of distiller's dried grains with solubles (DDGS) had a more pronounced effect than DDGS oil content on the performance and processing yields of broilers to 33 days of age.

W.A. Dozier explained that the test diets contained low-, moderate- or high-oil DDGS at moderate and high inclusion rates. The three sources of DDGS had ether extract contents of 6.1, 8.8 and 11.6 per cent (dry matter basis).

The diets contained maize, soybean meal, animal protein meal and one of three DDGS sources - five, seven or nine per cent (moderate inclusion rate) or eight, 10 and 12 per cent (high inclusion rate), respectively in the starter (days 1 to 14), grower (days 15 to 25) and finisher (days 26 to 33).

Apparent metabolisable energy and digestible amino acid values of the three DDGS sources had been determined from previous research at the Auburn laboratory.

Diets varying in DDGS source did not alter bodyweight gain or feed conversion in this study.

However, broilers fed diets formulated to the moderate inclusion rate of DDGS grew faster and more efficiently from days 1 to 25 and 1 to 33 than those given diets containing the higher inclusion rate.

The researchers noted significant interactions for feed conversion (days 1 to 25), carcass yield, total breast meat yield, wing yield and

abdominal fat percentage; birds fed diets containing high-energy DDGS at moderate inclusion rate had superior results for these parameters than the other dietary treatments.

## **Feed Adjustments Help Broilers Cope with Heat Stress**

The results of a floor pen experiment evaluating the effect of maize particle size in combination with either time-limited or ad libitum feeding on the performance of broilers to 49 days of age were reported by Satid Auttawong from North Carolina State University.

Feeding coarse maize and time-limited feeding significantly improved adjusted feed conversion ratio of the birds in this experiment. Adjusted feed conversion ratio was used as there were differences in mortality; the mechanism responsible for decreased mortality of broilers grown in hot weather may be a lower body temperature, the researchers commented.

Male chicks were fed either finely ground maize (ground with a hammermill to 262 microns; 2.4-mm screen) or coarsely ground maize (ground with a roller mill to 1082 microns) or various combinations of these two materials in the starter, grower and finisher.

Birds fed the coarsely ground maize consumed less feed but there were no treatment effects on bodyweight, mortality or cloacal temperature at 49 days of age, so this treatment resulted in the best adjusted feed conversion.

Feed intake and bodyweight were increased by ad libitum feeding but time-limited feeding improved adjusted feed conversion ratio and decreased mortality to 49 days of age.





## Investigating Optimum Limestone Particle Size for Pullets

A study at University of Nebraska, Lincoln, reported by Pamela Eusebio-Balcazar, evaluated the carry-over effects of limestone particle size fed to two different layer strains housed in aviaries or cages.

The mixture of fine and coarse particle sizes of limestone in the pullet diet positively influenced eggshell percentage and keel bone integrity during the layer phase.

Pullets were given diets containing either fine (F) or a blend of fine and coarse particle size (FC) limestone (Unical S=0.431mm versus FreFlo=0.879mm; ILC Resources, Des Moines, Iowa) from seven to 17 weeks of age.

The two strains were Lohmann Brown (B) and Bovans White (W). In the same environmentally controlled room, pullets were housed in aviary units (A) or cages (C).

Those destined for the aviaries were reared in litter floor pens until six weeks of age, while those destined for the cages were reared in brooder batteries to 10 weeks of age.

The limestone with mixed particle sizes increased eggshell percentage at 41 weeks and reduced keel bone fracture incidence for W hens and reduced keel bone depression incidence at 54 weeks. It did not influence hen bodyweight, bone mineral density or egg production.

The researchers observed differences between the strains in terms of bodyweight, egg production, egg size and bone parameters, as well as some interactions between strain and housing system.

Birds housed in the aviaries were heavier and produced fewer eggs than those in cages at some time-points and their eggs were heavier, had stronger egg shells and had a higher eggshell percentage at some stages. They also had a higher incidence of keel bone depression incidence than the caged hens.

### **Effects of a Mycotoxin on Broiler Health and Performance**

There are more than 400 different mycotoxins worldwide with trichothecenes forming the largest group, according to Karin Naehrer of Biomin Holding in Austria.

This group comprises type A (e.g. T-2 toxin and diacetoxyscirpenol) and type B (e.g. deoxynivalenol and nivalenol).

The most important source of trichothecenes contamination in cereal grains today is the Fusarium head blight, which is primarily caused by type-B trichothecene producers.

Due to its worldwide distribution in cereal grains as a common contaminant in animal feed, deoxynivalenol (DON) is one of the most important mycotoxins in the trichothecenes group.

Dr Naehrer reported a trial conducted to evaluate the efficacy of a mycotoxin-deactivating product (Mycofix® Select; MSE) in broiler diets to reduce the adverse effects of DON.

Contamination of broiler diet with DON adversely affected the growth of broiler chickens as well as damaging the DNA of blood lymphocytes and inducing lipid peroxidation and oxidative stress in the jejunal tissue. It also induced other changes suggesting an impairment of immune function.

Addition of MSE to the DON-contaminated diet counteracted these adverse effects.

Dr Naehrer said that, to counteract the effects of mycotoxins, applying an effective and long-standing mycotoxin risk management approach is crucial to minimise losses arising from the presence of these mycotoxins in animal feeds.

### **Effect of Organic Acids in Feed or Water on Salmonella Typhimurium in Broilers**

Three trials were performed to evaluate the effectiveness of formic acid and propionic acid on environmental and caecal recovery of the potential foodborne pathogen, Salmonella Typhimurium, reported Kim Wilson of the University of Georgia.

In two of the experiments - when the birds were exposed to Salmonella seeders for one week - those given formic acid in feed and water had the lowest recovery of Salmonella. Those given 5kg per ton of propionic acid for the six-week growing period showed no detectable levels of Salmonella in the caeca, litter or breast skin at the end of that time.

The other experiment - the first - had resulted in no treatment differences, which the researchers attributed to high exposure of Salmonella from seeders in the challenge pens for three weeks and low exposure in the other pens.

In the second trial, chicks were allocated to one of four treatments, namely formic acid in feed or water or both; there was also a negative control without formic acid. The lowest recovery of Salmonella from the caecum was from the group receiving formic acid in both feed and water.



The third experiment included propionic acid treatments; formic acid was included in the feed at 4 or 6kg per ton for the last two weeks of grow-out and this was compared with 5 or 10kg per ton of propionic acid in the feed for the whole six-week growing period or just the last two weeks; there was also a negative control.

At the end of the experimental period, the group on the low level of propionic acid throughout the six-week period had no Salmonella-positive caeca or litter in all pens. Those groups receiving the acids in weeks 5 and 6 as a clean-out supplement had at least one Salmonella-positive caecum.

Only the negative controls had Salmonella-positive breast skin (20 per cent) following scalding and defeathering.

### **In-feed Antibiotic Reduces the Environmental Impact of Broiler Production**

A study reported by Cody Brown from the University of Georgia aimed to compare responses of an antibiotic (virginiamycin; 20ppm) and/or a multi-enzyme product (Rovabio; 0.05 per cent) on the environmental impact of broiler production in the US, using typical commercial diets that were formulated to be low in energy (-110Kcal per kg) and contained wheat, distiller's dried grains with solubles (DDGS) and poultry by-product meal.

Despite the low-energy formulations, the birds in all groups grew faster than the breed standard. The best final weights (at 35 days) were achieved by the group receiving the antibiotic; the enzyme had no significant effects on performance.

Calculating the maize and soybean meal savings from feeding the antibiotic to broilers, the authors made a conservative assumption that feed additives like virginiamycin are capable of improving bodyweights by one per cent, feed conversion by two per cent and carcass yields by 0.5 per cent.

They calculated that yearly savings for a complex processing 1.2 million birds per week would amount to 410 hectares of maize and 724 hectares of soybeans with harvests typical of the US. Yearly savings for the national flock are of the magnitude of 55,000 hectares of maize and 98,000 hectares of soybean meal, they estimated.

### **Adding Phytase to Diets Containing Low-phytate Soybean Meal for Broilers**

An experiment investigating the effects of adding phytase to low-phytate and normal phytate soybean meal diets on performance, phosphorus digestibility, bone ash and bone strength of male broilers was reported by Basheer Nusairat from North Carolina State University.

Adding phytase to the diet with low-phytate soy had adverse effects on live performance, bone breaking strength and the percentage of bone ash. The researchers attributed these effects to a dietary imbalance associated with increased phosphorus digestibility.

As in previous trials, phytase improved live performance and phosphorus digestibility in birds fed the diets containing normal phytate soybean meal.

In this experiment, male broiler chicks were fed a typical maize-soybean diet, without phytase to nine days of age.

From 10 to 35 days, they received diets with low- or normal-phytate soybean meal, with or without phytase addition.

From 23 to 35 days, feed intake decreased when phytase was added to the low-phytate soy diet and bodyweight was reduced at 35 days.

Phytase improved phosphorus digestibility, decreased bone strength for both soy types and reduced bone ash in the low-phytate soy-based dietary treatment.

### **Microalgal Feed Additive Affects Broiler Health**

The long chain n-3 fatty acids, particularly docosahexaenoic acid (DHA, 22:6), are very important in the structure and function of cellular membranes, according to Lizza Macalintal from the Alltech-University of Kentucky Nutrition Research Alliance in her introduction to a study of the effects of dietary supplementation of microalgae on growth performance, immunity and fatty acid profile of broiler chicks.

Previous studies indicated that DHA provides unique properties to the lipid bilayer of cell membranes and contributes to membrane plasticity, fluidity and permeability, she said. These properties play a direct role in a variety of cellular and multicellular processes, including inflammation and immunity. Microalgae contain high amounts of omega-3 fatty acids, particularly DHA.

From their results, the researchers concluded that dietary supplementation of SP-1 enriched omega-3 fatty acid deposition in fat tissue and enhanced the immune response. Chicks were fed maize-soybean meal diets



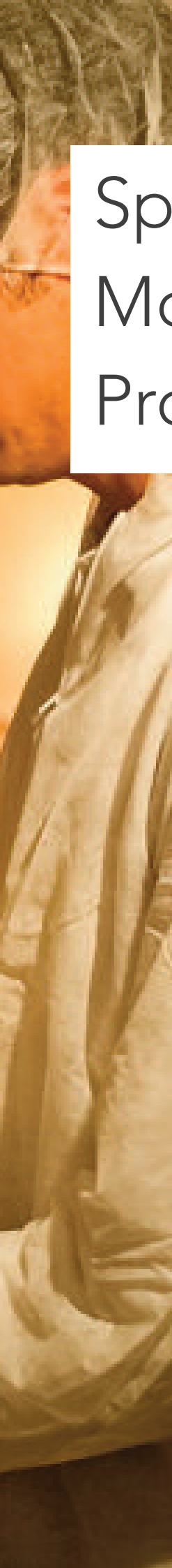
containing 0, 0.5, 1.0 or 2.0 per cent Schizochytrium sp (SP-1, Alltech, Inc.) for 28 days.

The addition of SP-1 did not affect the birds' feed intake, weight gain or feed conversion ratio to 21 days of age. However, linear increases were observed in the concentrations of DHA, eicosapentaenoic acid and total omega-3 FA in the abdominal fat with SP-1 supplementation.

Compared to other treatments, higher IgM titres persisted for 14 days after the first injection of sheep red blood cells for those birds fed diets with SP-1, and IgG titres were higher in this group seven days after a second injection. ■







# Split Feeding System for More Sustainable Egg Production

**The Split Feeding System delivers the optimal supply of nutrients in order to meet the specific needs of the hen during the egg formation process by supplying two different feeds per day.**

Nutreco's Research & Development group has been developing a new feeding programme since 2005 to feed laying hens according to the specific nutrient requirement of egg formation phase that varies throughout the day.

This feeding programme results in a more profitable egg production through reduced cost of production, improved eggshell quality, increased number of marketable eggs and improved performance under sustainability criteria.

## **Introduction**

Laying hens lay the majority of their eggs during the morning (Etches, 1986; Larbier and Leclercq, 1992). The interval between two successive ovipositions is about 24 hours or slightly greater (Keshavarz, 1998). After oviposition, the subsequent ovulation occurs about 30 minutes later.

During the first four hours, the egg white is formed. Thereafter, the egg moves through the shell gland and the shell is deposited around the albumen during approximately the next 20 hours (Larbier and Leclercq, 1992). This shell formation mainly takes place during the evening and night.

The requirements of laying hens for amino acids, energy, calcium and phosphorus do not remain constant but vary during the day. This depends on the hen's physiological needs for formation of the various components of the egg. Current methods of feeding laying hens with one diet with constant levels of nutrients may not result in optimal utilisation of the nutrients (Chah, 1972; Leeson and Summers, 1997).



When birds are offered diets that allow self-selection of nutrients, there is an increased intake of protein and energy observed in the morning around time when the egg is produced. The intake of calcium is higher during the later part of the day. In a study by Chah (1972) in which hens were offered diets that allow self-selection of nutrients, the total daily intake of protein was 11 per cent lower, while intakes of energy and calcium were eight per cent and 26 per cent, respectively, lower than hens fed a single, normal diet (Figure 1).

feeding programme since 2005 to feed laying hens according to the specific nutrient requirement for egg formation that varies throughout the day.

The main objective of the research was to determine accurately the nutrient requirements of energy, amino acids, calcium and phosphorus during the morning and the afternoon when two diets were fed.

The finding of this research resulted in the de

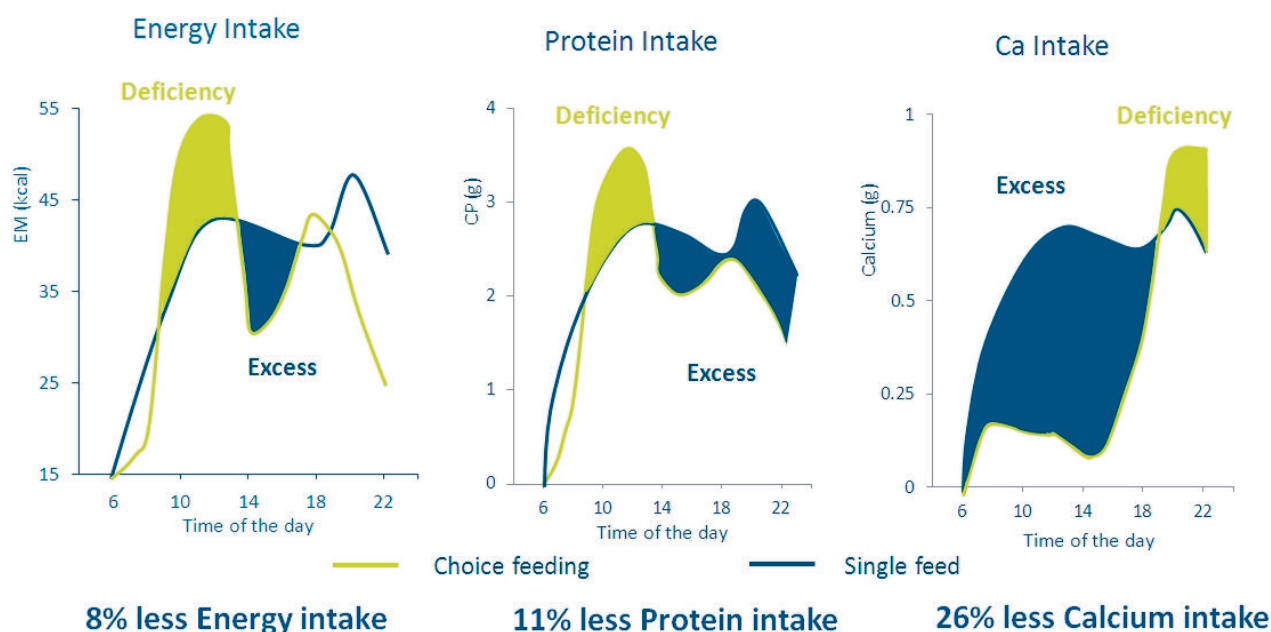


Figure 1. Nutrients intake along the day with a single feed and a choice feeding system.

This suggests that the hen is using the energy, amino acids, calcium and phosphorus more efficiently by consuming these nutrients at moments of the day when the requirements are high. Therefore, the current practice of providing hens with only one diet might not be an ideal approach for optimal utilisation of nutrients.

### Experimental Design Trials

Nutreco R&D has been developing a new

velopment of the Split Feeding programme where two diets are used to meet the dynamic requirements egg formation:

- Morning diet : meets the requirements of early phases of egg formation
- Afternoon feed: meets the requirements of shell formation

Each experiment performed focused on a single nutrient in order to obtain the optimum

level for the morning and afternoon feeds. Each nutrient was tested in laying hens during early and late lay. In addition, a trial using the Split Feeding System, including the optimum level of each nutrient, was performed for a whole cycle.

All experiments consisted of several treatments and a control group which was fed a single diet. Number of replicates per treatment consisted of at least 36 individually housed hens.

As a result of the trials, new requirements for energy, amino acids, calcium and phospho-

rus were obtained for the morning and afternoon diets.

Compared to the single feed, the total intake of those nutrients can be reduced to an extent (Figure 2). As well as the reduction in nutrient intake, performance was at least as good as when a single feed is applied. Extra benefits were also observed during the project.

### Split Feeding improves eggshell quality

From all the experiments performed with the Split Feeding system, a consistent improve-

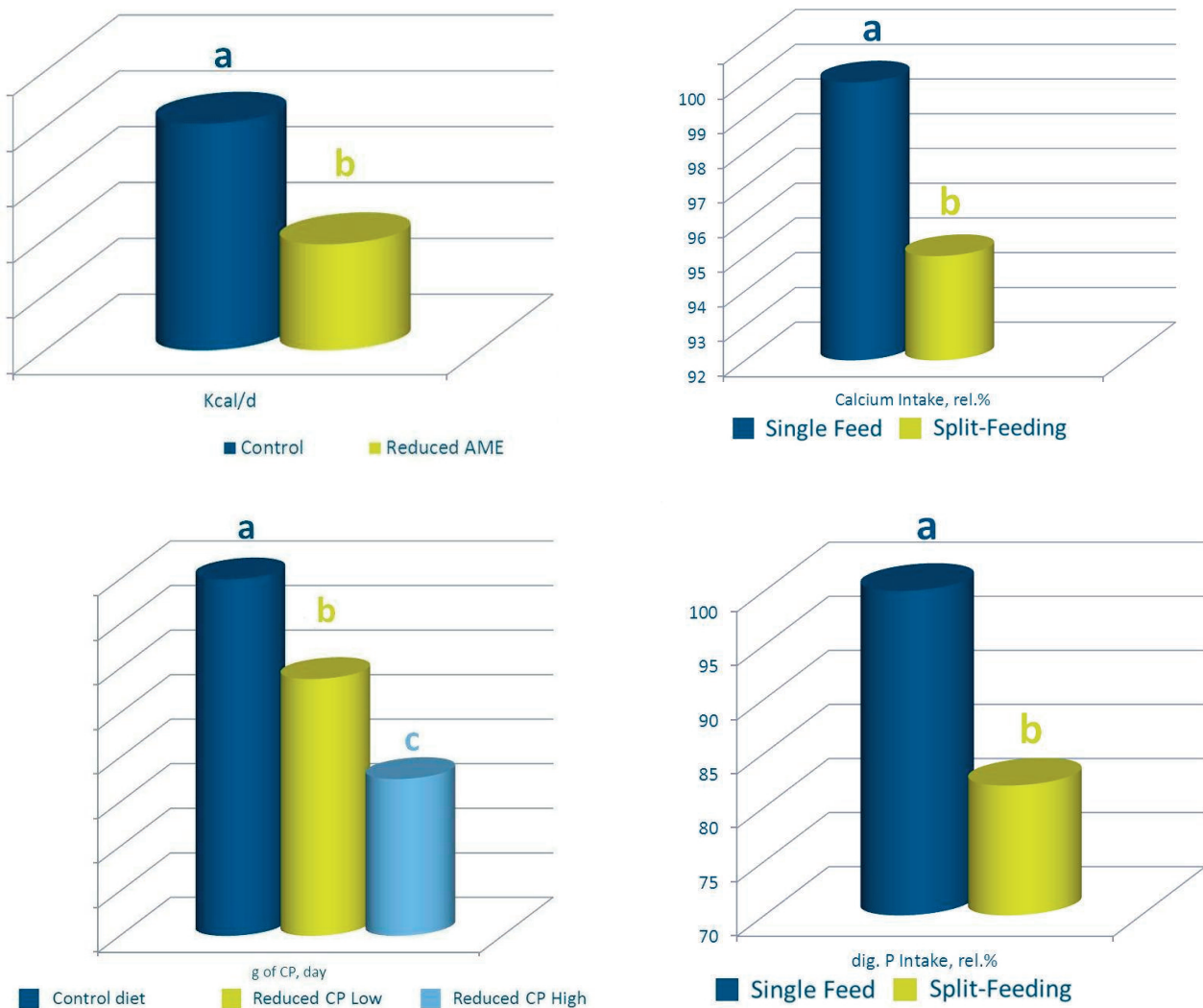


Figure 2. Effect of Split Feeding on nutrient intake compared to a single diet



ment in eggshell quality (eggshell weight, thickness or SWUSA = eggshell weight per unit of surface area) compared to a single control feed, was observed (Figure 3).

The effect of a change in feeding system was tested in an old flock (from 91 to 98 weeks of age). The first four weeks (weeks 91 to 94), a single feed was used and the next four weeks

single feed system, and significantly increased the number of sellable eggs (Figure 4).

### Split Feeding consistently reduces the amount of nutrient loss in excreta

In the three experiments in which the effects of Split Feeding on nutrient excretion were

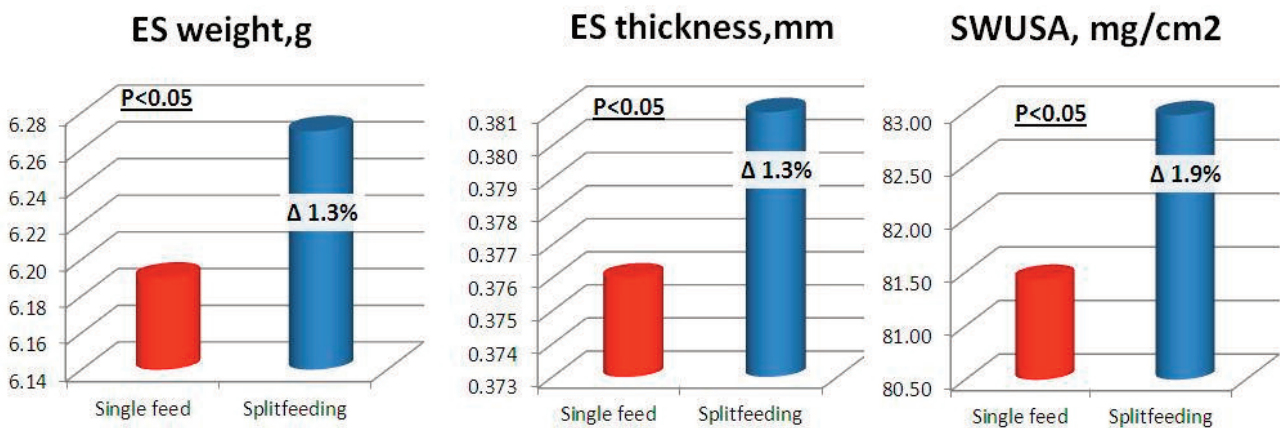


Figure 3. Effects of single versus Split feeding on eggshell quality

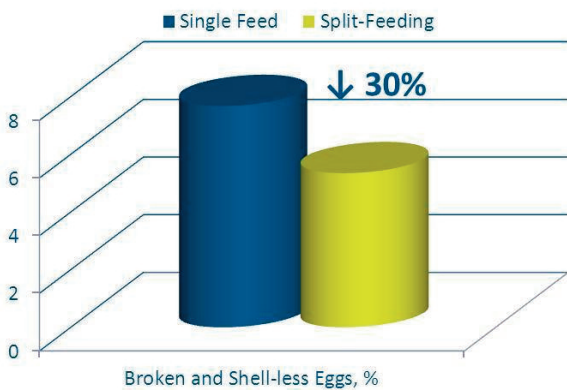


Figure 4. Effects of single versus Split feeding on production of non-sellable eggs on eggshell quality

(weeks 95 to 98), laying hens were fed with an equivalent Split Feeding programme.

The Split Feeding system significantly reduced the percentage of broken and shell-less eggs compared to the values obtained during the preceding period, when using a

studied, the results proved Split Feeding is a more sustainable feeding programme because of the reduced levels of nitrogen, phosphorus and calcium in the excreta (Figure 5).

A lower daily nutrient intake and better use of those nutrients were achieved with the Split Feeding system as nutrients are provided when the laying hens require them.

### Conclusions

The Split Feeding system is an alternative system for feeding layers. With this system the laying hen is closer to the voluntary and physiological feeding behaviour and adjusts its nutrient intake according to the different requirements throughout the day.

For that purpose two different diets are provided:

## Single versus Split feeding: effects on egg production

Diet and period	Eggs produced	Sellable eggs produced
Single feed (91-94 wks)	73.17	66.74 b
Split Feeding (95-98 wks)	72.23	69.26 a
SEM (n=128)	1.71	1.79

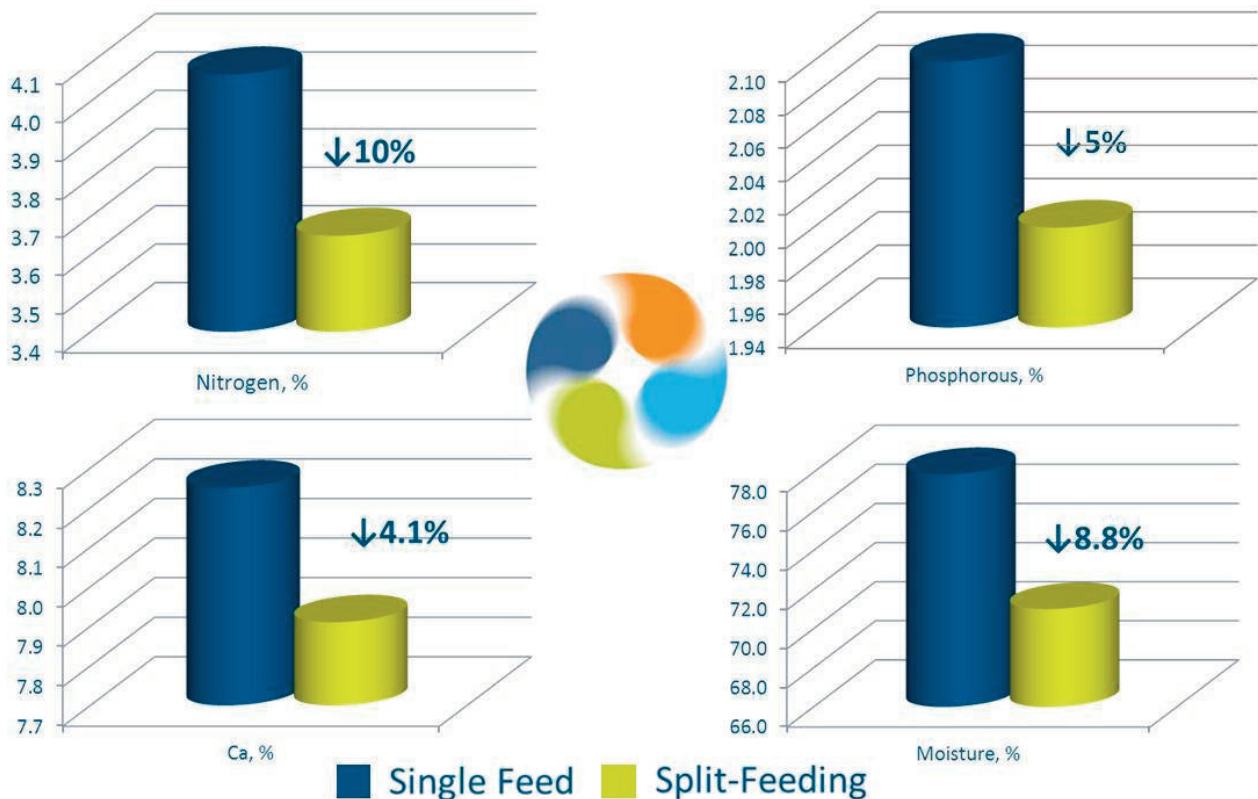


Figure 5. Effects of single versus Split Feeding on nutrient excretion and faecal composition

The morning diet is designed to fit requirements during the morning when the albumen is being formed, and ovulation and oviposition occur.

The afternoon diet is designed to meet requirements for eggshell formation.

This adaptation to the physiological requirements of the laying hen during the day allows the Split Feeding system to be a more efficient feeding programme:

- Split Feeding brings the optimal supply of

nutrients in order to meet the needs of hens in the egg formation process and more profitable and sustainable egg production, with a lower production cost.

- Split Feeding offers the following benefits:
  - More profitable egg production by reduction of production cost.
  - Improved eggshell quality and increased number of marketed eggs.
  - Improved nutrient efficiency and sustainability. ■





Global Poultry Trends.2013

# Asia Supplies 60 Per Cent of World's Eggs

Egg production in Asia accounts for nearly 60 per cent of the world total, according to industry analyst, Terry Evans.

In 2011, egg output in this region amounted to 38.3 million tonnes, which was 58.7 per cent of the global figure of 65.2 million tonnes. While it looks as though 2012 saw little or no growth, Asia's egg industries now appear to have embarked on the expansion road again with production estimated to have reached at least 39 million tonnes last year which would equate with around 58.5 per cent of a global forecast of a little below 67 million tonnes (Table 1).

The growing importance of Asia when com-

pared with the other major regions is evident from Figure 1. Over the period 2000 to 2011 Asia's egg industry grew by almost 2.6 per cent per year. As this was a little faster than the global total - which was a shade under 2.3 per cent - so Asia's contribution actually rose from 56.8 per cent to 58.8 per cent

These Food and Agriculture (FAO) figures include all layers, both commercial and backyard flocks. Also, in most instances, hatching eggs are included. Globally, hatching eggs are considered to represent around five per



**Table 1. World egg production (million tonnes)**

Region	2000	2005	2006	2007	2008	2009	2010	2011	2012E	2013E
Africa	1.9	2.2	2.3	2.5	2.6	2.6	2.7	2.8	2.9	3.0
Americas	10.5	11.7	12.3	12.3	12.5	12.6	13.0	13.2	13.4	13.6
Asia	29.0	32.6	33.0	34.5	36.2	37.2	37.7	38.3	38.3	39.0
Europe	9.5	9.9	10.1	10.0	10.1	10.3	10.5	10.6	10.6	10.8
Oceania	0.2	0.2	0.2	0.2	0.2	0.2	0.3	0.3	0.3	0.3
<b>WORLD</b>	<b>51.1</b>	<b>56.6</b>	<b>57.9</b>	<b>59.5</b>	<b>61.7</b>	<b>62.8</b>	<b>64.1</b>	<b>65.2</b>	<b>65.5</b>	<b>66.7</b>

Sources: FAO to 2011; 2012 and 2013 author's estimates

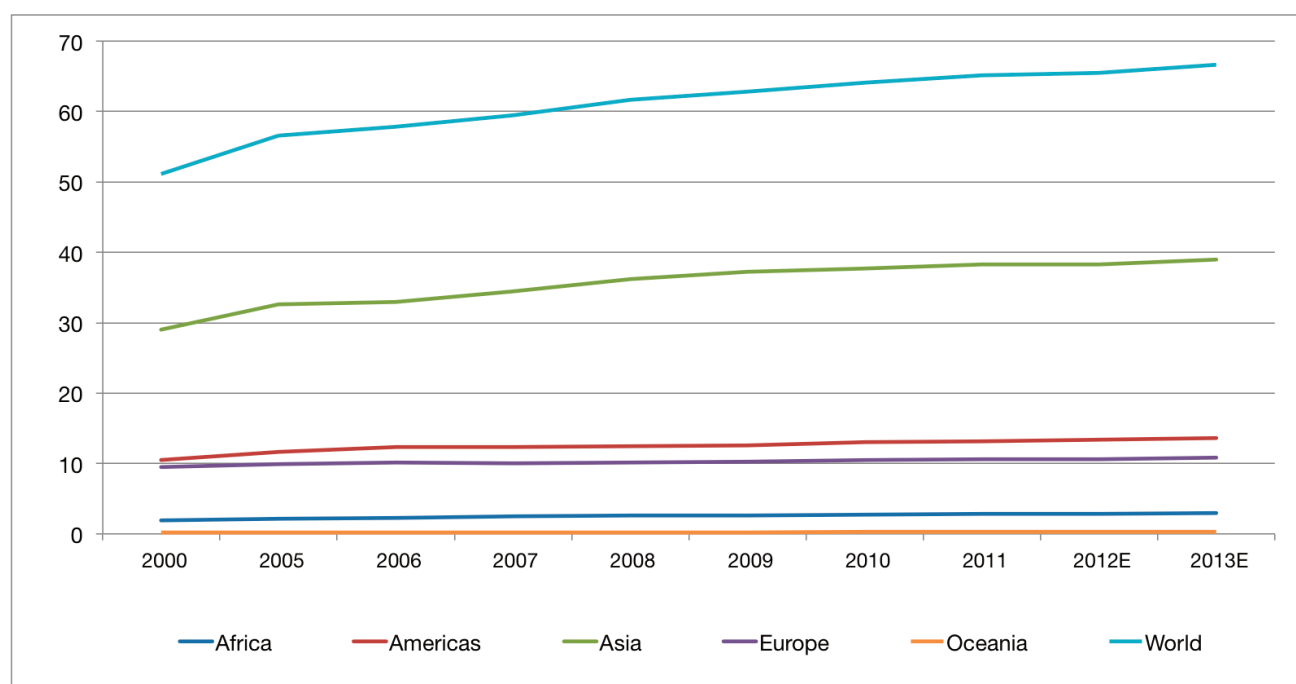


Figure 1. World hen egg production (million tonnes)

cent of production but on an individual country basis the proportion of hatching eggs can range from an insignificant amount up to 12 per cent or more in countries which have a large broiler industry in relation to the size of the layer sector.

FAO data indicate that the total number of layers worldwide in 2000 stood at 5,004 million, of which 3,055 million (61 per cent) were in Asia. By 2011, the world total had risen to 6,617 million with 4,220 million (64 per cent) in Asia.

In 2011, some 31 million tonnes, or more than 80 per cent of Asia's production, came from just four countries - China (24 million tonnes), India (3.5 million tonnes), Japan (2.5 million tonnes) and Indonesia (1.2 million tonnes).

An additional six countries, each producing more than 500,000 tonnes a year, accounted for a further four million tonnes (10 per cent), namely Turkey, Iran, Pakistan, the Republic of Korea and Malaysia. Thus, the 10 largest producers were responsible for almost 35 million

**Table 2. Hen egg production in Asia ('000 tonnes)**

<b>Country</b>	<b>2000</b>	<b>2005</b>	<b>2007</b>	<b>2008</b>	<b>2009</b>	<b>2010</b>	<b>2011</b>
Afghanistan	15.0	21.8	16.9	16.7	16.8	16.3	17.2
Armenia	21.4	28.8	28.9	31.7	34.7	38.2	34.7
Azerbaijan	30.4	49.0	52.3	69.6	72.9	70.9	60.9
Bahrain	2.7	2.0	3.0	2.7	2.9	3.0	3.0
Bangladesh	125.0	185.0	177.0	186.0	154.0	188.0	199.0
Bhutan	0.4	0.3	0.3	0.3	0.3	0.3	0.3
Brunei Darussalam	4.8	5.7	6.3	6.8	6.9	7.0	7.0
Cambodia	11.7	13.3	17.1	16.8	15.9	17.6	17.6
China, Hong Kong SAR	0.4	0.3	0.3	0.3	0.3	0.3	0.3
China, Macao SAR	1.0	0.6	0.9	0.4	0.4	0.4	0.4
China, mainland	18,547.0	20,724.0	21,499.0	2,296.8	23,311.3	23,653.0	23,897.0
China, Taiwan	363.5	315.7	333.0	323.5	321.6	336.4	334.0
Cyprus	10.6	9.5	8.6	10.0	9.8	8.6	8.3
Georgia	20.1	28.0	24.3	24.3	24.3	24.6	26.8
India	2,035.0	2,568.0	2,947.0	3,047.0	3,230.0	3,378.1	3,490.0
Indonesia	642.0	856.6	1,174.6	1,122.6	1,071.5	1,121.1	1,166.4
Iran Isl. Rep.	579.0	758.0	703.0	727.0	725.4	741.0	741.0
Iraq	29.6	51.7	40.4	45.8	35.3	46.3	50.9
Israel	87.9	92.4	93.5	96.3	100.8	102.5	120.9
Japan	2,535.4	2,481.0	2,583.3	2,553.6	2,507.5	2,515.3	2,482.6
Jordan	45.8	40.6	38.8	50.6	45.9	69.3	69.4
Kazakhstan	93.8	139.4	148.3	166.4	184.0	207.3	207.2
Korea Dem. Peo. Rep.	110.0	130.0	103.0	107.0	104.0	114.0	120.0
Korea Rep.	478.8	514.9	543.8	566.1	602.0	590.0	595.0
Kuwait	21.3	26.0	22.0	22.0	35.0	40.0	40.0
Kyrgyzstan	11.4	17.7	20.8	20.6	20.6	20.8	21.9
Lao Peo. Dem. Rep.	10.0	13.0	13.4	14.5	14.8	15.0	15.0
Lebanon	43.2	45.5	45.7	45.7	47.0	47.0	47.0
Malaysia	390.6	442.0	476.0	479.0	510.0	540.4	540.4
Mongolia	0.4	0.5	0.4	0.5	0.3	0.5	0.5
Myanmar	112.0	186.6	231.5	263.4	318.3	342.1	371.7
Nepal	22.2	28.8	30.1	30.9	30.8	31.5	34.6
Occ Palestinian Terr.	36.9	37.4	41.0	39.4	36.6	29.0	30.0
Oman	6.8	9.5	9.0	9.3	9.3	9.3	10.7
Pakistan	344.1	400.9	479.3	503.4	529.1	556.4	604.3
Philippines	243.4	320.3	335.1	350.8	368.5	387.3	403.4
Qatar	2.7	4.1	2.9	2.9	4.3	4.5	5.0
Saudi Arabia	128.5	169.6	170.6	170.0	191.0	193.0	193.0
Singapore	16.0	20.6	22.4	20.3	20.0	20.4	23.0
Sri Lanka	52.3	49.0	51.9	59.0	64.8	64.7	67.3
Syrian Arab Rep.	127.3	155.2	171.4	151.4	162.4	163.3	171.9
Tajikistan	1.5	5.5	6.2	8.5	10.6	13.1	14.3
Thailand	514.6	468.7	539.4	565.6	577.0	585.4	601.0
Timor-Leste	1.2	0.9	1.0	1.0	1.1	1.1	1.1
Turkey	810.0	753.3	795.3	824.4	864.6	740.0	810.0
Turkmenistan	21.0	45.1	47.9	47.7	49.6	49.5	49.5
United Arab Emirates	14.6	17.2	25.4	25.4	30.0	26.1	26.1
Uzbekistan	68.9	107.8	121.2	132.9	148.7	170.9	192.3
Viet Nam	185.4	197.4	223.0	247.0	273.3	321.1	344.8
Yemen	31.1	48.4	53.6	56.4	58.6	60.6	62.0
<b>ASIA</b>	<b>29,008.7</b>	<b>32,587.4</b>	<b>34,479.5</b>	<b>36,231.1</b>	<b>36,954.4</b>	<b>37,682.7</b>	<b>38,330.6</b>
<b>WORLD</b>	<b>51,048.6</b>	<b>56,559.6</b>	<b>59,518.2</b>	<b>61,655.5</b>	<b>62,751.1</b>	<b>64,085.5</b>	<b>65,181.3</b>

Source: FAO

tonnes or 91 per cent of the regional total (Table 4).

Although when compared with 2000, the total produced by these 10 nations increased by nearly one-third, the variation in the performance of the individual countries was wide ranging from Japan and Turkey where output showed virtually no change, to Indonesia (+82 per cent), Pakistan (+76 per cent) and India (+72 per cent). Outside this Top 10, several countries reported excellent growth. Output in Myanmar more than trebled, reaching 372,000 tonnes in 2011, while production doubled or more so in Kazakhstan, Uzbekistan, Yemen, Azerbaijan, Turkmenistan, Kuwait and Kyrgyzstan (Table 2).

Not surprisingly, mainland **China's** industry dominates the scene, accounting for almost 24 million tonnes (62 per cent) of the regional total of 38.3 million tonnes in 2011 (Tables 2 and 3) and almost 37 per cent of the world total of 65.2 million tonnes. However, a little surprising, is that mainland China's contribution to the Asia total in percentage terms actually declined a little from 63.9 per cent to 62.3 per cent between 2000 and 2011. During this period China's average growth rate was 2.3 per cent per year.

One series of figures quotes egg production in China in 2012 at more than 28.6 million tonnes. However, this total includes some 4.2 million tonnes of eggs other than hen eggs.

Data published by the International Egg Commission (IEC) indicates that output in China in 2012 had contracted from 24 to 23 million tonnes although this might have been due in part to the 2012 figure being based on an average egg weight of 62g compared with 63g which was used in the 2011 calculation.

**Table 3. Asian egg production ranking in 2011**  
('000 tonnes)

Country	Production
China, mainland	23,897.0
India	3,490.0
Japan	2,482.6
Indonesia	1,166.4
Turkey	810.0
Iran Isl. Rep.	741.0
Pakistan	604.3
Thailand	601.0
Korea Rep.	595.0
Malaysia	540.4
Philippines	403.4
Myanmar	371.7
Viet Nam	344.8
China, Taiwan	334.0
Kazakhstan	207.2
Bangladesh	199.0
Saudi Arabia	193.0
Uzbekistan	192.3
Syrian Arab Rep.	171.9
Israel	120.9
Korea Dem. Peo. Rep.	120.0
Jordan	69.4
Sri Lanka	67.3
Yemen	62.0
Azerbaijan	60.9
Iraq	50.9
Turkmenistan	49.5
Lebanon	47.0
Kuwait	40.0
Armenia	34.7
Nepal	34.6
Occ. Palestinian Terr.	30.0
Georgia	26.8
United Arab Emirates	26.1
Singapore	23.0
Kyrgyzstan	21.9
Cambodia	17.6
Afghanistan	17.2
Lao Peo. Dem. Rep.	15.0
Tajikistan	14.3
Oman	10.7
Cyprus	8.3
Brunei Darussalam	7.0
Qatar	5.0
Bahrain	3.0
Timor-Leste	1.1
Mongolia	0.5
China, Macao SAR	0.4
Bhutan	0.3
China, Hong Kong SAR	0.3

Source: FAO



**Table 4. Leading egg-producing countries in Asia ('000 tonnes)**

Country	2000	2006	2007	2008	2009	2010	2011
China, mainland	18,547.0	20,724.0	21,499.0	22,968.0	23,311.3	23,653.0	23,897.0
India	2,035.0	2,568.0	2,947.0	3,047.0	3,230.0	3,378.1	3,490.0
Japan	2,535.4	2,481.0	2,583.3	2,553.6	2,507.5	2,515.3	2,482.6
Indonesia	642.0	856.6	1,174.6	1,122.6	1,071.5	1,121.1	1,166.4
Turkey	810.0	753.3	795.3	824.4	864.6	740.0	810.0
Iran Isl. Rep.	579.0	758.0	703.0	727.0	725.4	741.0	741.0
Pakistan	344.1	400.9	479.3	503.4	529.1	556.4	604.3
Thailand	514.6	468.7	539.4	565.6	577.0	585.4	601.0
Korea Rep.	478.8	514.9	543.8	566.1	602.0	590.0	595.0
Malaysia	390.6	442.0	476.0	479.0	510.0	540.4	540.4
<b>Total of above</b>	<b>26,876.5</b>	<b>29,969.4</b>	<b>31,740.7</b>	<b>12,685.5</b>	<b>33,928.4</b>	<b>34,420.7</b>	<b>34,927.7]</b>

Source: FAO

Some 90 per cent of China's commercial flock is considered to be in cages with nine per cent on free range and one per cent in a barn system. Around 90 per cent are white-egg layers. Short-term forecasts point to continued growth of about two per cent per year to 2017.

All the data on the egg industry in **India** point to strong growth over the past decade or so with an average of between five and six per cent per year. However, estimates of output vary greatly according to source. FAO statistics indicate that production has increased from 2.0 million tonnes in 2000 to 3.5 million tonnes in 2011. In terms of the number of eggs produced these tonnages translate to 36.6 billion in 2000 and 63.5 billion in 2011.

India's ICRA (formerly Investment Information and Credit Rating Agency of India Limited) estimates egg output in 2012 to have been 66

billion, while the Associated Chambers of Commerce and Industry of India (ASSOCHAM) puts production in that year at 75 billion with a forecast for 2015 of 95 billion eggs.

India's reporter to the IEC maintains that egg production has risen from 3.34 million tonnes in 2009 to 4.16 million tonnes in 2012. At an average egg weight of 55g, this latter figure equates with 75.6 billion eggs.

Despite these differences, the general consensus is that the industry has exhibited rapid growth and will continue to do so though the forecasts range between four and eight per cent per year.

The ratio of brown to white eggs in India is considered to be 8:92 with 100 per cent of the commercial flock housed in cages. However, the Humane Society International/India

claims that it has persuaded the top-egg producing states to declare that confining hens to battery cages validates the Prevention of Cruelty to Animals Act of 1960 and that the Animal Welfare Board of India has issued an advisory notice to all state governments stating that no new battery cages should be installed and that existing cages should be phased out by 2017.

With the increased costs involved in switching to less intensive forms of production, if cages were to be banned, it could have a drastic effect on the industry's future growth rates.

Although **Japan** is the third largest producer in Asia, its annual output has shown little movement since 2000 at around 2.5 million tonnes a year. Just over 60 per cent of the eggs are white-shelled, while 96 per cent of the flock is housed in cages.

While egg production in **Indonesia** grew by 82 per cent - or 5.6 per cent per year - between 2000 and 2011, in the last three years of this series the gains slowed to 1.3 per cent. The level of egg consumption per person is low, pointing to considerable potential for future growth although even if the uptake per person fails to expand, total consumption will rise in line with population growth which is expected to average around one per cent per year in the near future.

According to FAO figures, **Turkey's** egg industry has shown no significant growth between 2000 and 2011. However, data provided by the IEC point to a higher level of annual production, and a sharp recovery in 2012 when output rose to almost 1.1 million tonnes from 874,000 tonnes in the previous year. All birds are housed in cages with some 75 per cent of the eggs being white.



Between 2000 and 2010 egg production in **Iran** grew by 2.5 per cent per year. Although the FAO data for 2011 shows no change over the previous year, there are occasions when if the official figures for a year are not available, the previous year's figures are inserted in order to arrive at a regional total. IEC figures put the 2010 total a little higher than the FAO (Table 4) at 766,000 tonnes. Output then declined in 2011 as a result of highly pathogenic avian influenza (HPAI) outbreaks to 700,000 tonnes but then rebounded to 912,000 tonnes in 2012. All production is in cages and almost entirely white-shelled. ■





# Windrow Composting Broiler Litter between Flocks

A review of the process of windrow composting of broiler litter in the house between flocks from Mississippi State University's Extension Service, focusing especially on controlling pathogens and litter moisture as well as avoiding conditions that exacerbate footpad dermatitis.

Windrow composting broiler litter between flocks has become an accepted and increasingly popular method for reducing the microbial loads in broiler houses. Integrators and growers have discovered that windrowing litter can improve bird performance and reduce likelihood of disease spread when a total clean-out is not undertaken.

In many broiler complexes today, a total clean-out may occur only every several years. Windrowing allows the natural metabolism of bacteria present in the litter to cause a partial composting process to take place and, under

the right conditions, generates enough heat within the windrow to destroy many pathogenic bacteria and other microorganisms.

This results in well-conditioned litter for the next flock with a decreased microbial load, according to the report's authors, Tom Tabler (Extension Professor, Poultry Science), F. Dustan Clark (Extension Poultry Health Veterinarian, University of Arkansas Cooperative Extension Service), Jonathan R. Moyle (Extension Poultry Specialist, University of Maryland Extension) Yi Liang (Assistant Professor, Extension, Biological and Agricultural Engi-



neering Department, University of Arkansas), Jessica Wells (Extension Instructor, Poultry Science) and Morgan Farnell (Associate Professor, Poultry Science).

## Litter Management

Bacteria and other microorganisms have always been a part of poultry production. Even with the best efforts of growers and integrators, it is impossible to totally sterilise the poultry house environment. However, by properly managing litter moisture, ammonia and pH, growers can maintain acceptable bacterial levels that help reduce disease challenges and maintain bird performance.

A variety of microorganisms, including *Salmonella*, *Escherichia coli*, *Clostridium*, *Campylobacter*, *Staphylococcus aureus* and others, are pathogenic to humans and also to poultry, causing serious infections that can lead to death (Lavergne et al., 2006). However, poultry litter, with its high pH and high ammonia concentrations, is a harsh environment that can help control many microorganisms. Unfortunately, *Salmonella* and *Clostridium* can survive in poultry litter, making litter management more challenging.

Even though the bacterial make-up and population in a broiler house is quite dynamic, given time the litter begins to stabilise and develops predictable patterns unique to a grower's management style, housing design, internal environment and the birds themselves (Hess et al., 2007).

Bacteria in litter can be classified as either spore formers or non-spore formers. Non-spore-forming bacteria (*E. coli*, *Staphylococcus*, etc) increase with the presence of birds in the house and increasing amounts of faecal

matter. Spore-forming bacteria such as *Clostridium perfringens*, the causative agent for necrotic enteritis and gangrenous dermatitis, tend to increase with time as litter ages and number of flocks increase.

Spore-formers are difficult to destroy because they have the capability, when environmental conditions worsen, to form a metabolically inactive body (called a spore). Spores are able to withstand harsh environmental conditions that kill many bacteria. Macklin et al. (2007) reported that the rapid temperature change of the litter with windrow composting may catch *Clostridium* unprepared to form a spore, resulting in decreased populations of spore-forming *Clostridium*.

Keep in mind that windrow composting will not reduce the amount of litter that accumulates in the house. The small amount of time litter is actually spent 'composting' in a windrow is not long enough to degrade or reduce any appreciable amount of litter. When litter levels get too deep, growers will still have to remove some of the litter from the house. However, by leaving litter in the house for extended periods, growers are better able to choose the ideal time to remove excess litter based on agronomic or economic considerations.

## Litter Moisture Concerns

Growers often wonder about how litter moisture levels affect the heating process and how higher litter temperatures affect the potential for ammonia volatilisation.

Two frequently asked questions concerning management options immediately before windrowing are 1) whether or not to decake and 2) whether or not to add additional water

to the litter (Liang et al., 2013). It is a common belief that incorporating caked litter helps retain moisture, allowing the windrow to heat properly and avoiding the extra fuel and labor associated with decaking. However, some operations require cake removal before windrowing.

Liang et al. (2013) added 900 gallons of water to one windrowed house and no additional water to another. With 900 gallons of added water, moisture content was expected to increase by 3.5 per cent after two flocks on the same litter but only by about two per cent after five flocks. A significant decrease in litter moisture content occurred after seven to 13 days of windrowing although moisture content of the windrowed litter with water addition was slightly higher than that without water addition. However, windrows with water addition had higher temperatures and stayed hotter longer.

Water-soluble phosphorus increased in both the windrowed and non-windrowed litter (Liang et al., 2013). This indicated that an appreciable degree of biotic (living factors — bacteria, fungi and viruses) and abiotic (non-living factors — temperature, ammonia, season etc.) activity occurred in the litter with both treatments after flocks were removed.

Overall, there were no negative impacts of windrow treatments on litter quality (Liang et al., 2013). However, high ammonia emissions persisted for several days after windrows were spread back out. Without a litter amendment, at least four days were necessary to purge ammonia with proper ventilation before chick placement.

In this situation, using a litter amendment is a better choice than running the fans more

often during cold weather without a litter amendment.

## **Paw Quality**

It may seem hard to believe, but broiler feet, or 'paws', are now the third most profitable part of the chicken. Only the breasts and wings are more valuable. The paw is the portion of the leg below the spur. Litter conditions have a large impact on paw quality. Controlling paw quality has become an important issue because of the potential profit associated with the overseas paw market and because paw quality is now one of the variables used in animal welfare programs.

Many cases of footpad dermatitis are the result of poor litter conditions. Footpad dermatitis is inflammation and ulcers on the footpad and toes of broilers, which cause paws to be downgraded or condemned during processing. It appears increasingly evident that footpad dermatitis can begin the first week, based on litter quality. Therefore, it is critical that the litter stay dry.

Litter that has been properly windrowed will be drier than non-windrowed litter and have a decreased bacterial load. This is important, especially for young chicks, when the feet are tender and wet litter and ammonia can cause cracked skin and ammonia burns. The result can be serious paw damage that may linger and worsen throughout the flock.

Early paw damage can lead to product downgrades, food safety issues (lesions can serve as entry points for bacteria and other microorganisms), and animal welfare concerns. Bird performance may also be affected if foot pain prevents birds from feeding and drinking properly.

The percentage of birds with paw quality issues may also be seen as a reflection of a grower's concern for animal welfare and the well-being of the birds in that grower's care. Paw quality scores can affect pass/fail on animal welfare audits, which are now common practice in the poultry industry.

Several possible causes of footpad dermatitis have been identified:

- Litter — type, quality and quantity
- Drinker design and management
- House humidity
- Ventilation programme
- Diet composition
- Gut health

Of these, litter is likely the most important factor. From chick placement to harvest, footpads are in constant contact with the litter surface. Wet litter - greater than 30 per cent moisture - is often associated with the occurrence and severity of footpad dermatitis.

Still, there are exceptions that defy explanation. There are occasions at the processing plant when birds on good-quality litter have poor paw quality and birds on poor litter have good-quality paws.

In addition, the location of birds in the house can make a difference in paw quality, especially during the summer. More damp, caked litter and slow air speeds in the cool cell end leads to more paw quality problems in that end than in the fan end where the litter is usually drier.

Proper windrowing may result in litter that starts out in excellent condition but it takes good management throughout the flock to maintain litter quality.

Season can also play a role in litter quality. Ventilation to remove excess moisture is important to keeping dry floors. Plenty of ventilation during the summer is usually not a problem. However, adequate ventilation during the winter becomes a challenge due to high fuel prices. Growers may choose to conserve heat by sacrificing ventilation, which increases the likelihood of wet litter. Winter is always a critical period for footpad dermatitis, and often we see an increased incidence in winter.

### **Other Issues**

There is a host of other important factors to keep in mind when considering windrow composting:

- Downtime between flocks
- Number and dimensions of windrows to build
- Tractor time required
- Turning and leveling litter before chick placement
- Litter depth
- Insecticide application (must be timely)
- Ventilation schedule (should have continuous ammonia removal)

A minimum of 12 to 14 days is required if windrow-turning is included. Turning is important to ensure that all the litter is adequately heated. If decaking before windrowing, do it as soon as possible after flock removal. Build the first windrow(s) as soon as possible after the flock is removed, and leave them in place at least three days (Figure 1). Turn the first windrow(s) after three days and leave in place for a further three days.

Spread litter back out and level at least four days before chick placement. Make sure the





Figure 1. Build the windrow and leave at least three days before turning.



Figure 3. Pull all the litter away from the footing and into the windrow.



Figure 2. Make sure the litter is level for young chicks.



Figure 4. Windrow heating will drive litter beetles to the top of the windrow.

litter is level (Figure 2). Chicks are not good at navigating the hills and valleys of uneven litter.

The number of windrows will depend on litter depth and the equipment used. Windrow height should be at least 18 inches but no more than four feet, and windrow(s) should run the length of the house. Windrow width can vary and is not critical as long as height and length are correct.

Windrowing does take some tractor time and is dependent on grower expertise and the equipment used. If you use a contractor or share equipment with a neighbour, make sure

all equipment is clean before coming on the farm. If you do it yourself, allow one to four hours to build the first windrow(s), depending on your expertise.

Turning may require the same or less time as initial construction. Levelling generally requires more time than windrowing because the surface has to be smooth and flat for young chicks. Be sure to incorporate the hardpan into the windrow but do not dig into the dirt floor. Pull ALL the litter into the windrow (Figure 3). Do not leave a six- or eight-inch strip along the side walls untouched.

If the litter is too deep, remove excess litter

either before or after windrowing but before the litter is levelled for the final time.

Check with your service tech or broiler manager on the proper depth. In most cases, three to six inches of litter works best for optimal bird performance. Fewer than three inches is not enough (birds will dig down to the pad), and more than six inches makes it more difficult to manage.

The windrow will begin to heat shortly after construction. The heating process will quickly drive litter beetles to the top of the windrow (Figure 4). Therefore, make plans to apply insecticides within 24 hours of windrow construction. Spray the windrow(s) and the exposed footers for maximum effect.

Ventilation should be continuous from flock harvest until pre-heating for the next flock. End doors should remain closed (unless you are working with heavy equipment in the houses) for biosecurity purposes. Curtains can be dropped on curtain-sided houses, while solid sidewall houses should run either one 48-inch or two 36-inch fans to remove ammonia on a continuous basis.

After litter is levelled, consider using a litter amendment to help control ammonia in the days just before and immediately after chick placement.

## Summary

Due to the increasing difficulty and cost associated with obtaining quality poultry bedding materials, it is now common practice for broiler growers to grow multiple flocks over perhaps multiple years on built-up litter.

This presents challenges in terms of an in-

crease in litter moisture, ammonia production and bacteria numbers. Windrow composting built-up litter in-house, when done correctly, can offset some of these challenges.

The technique takes advantage of heat produced by microorganisms during organic matter degradation to help dry the litter and kill many bacteria that are present.

Windrowing litter is a process that requires at least 12 to 14 days of downtime. It includes building, turning and levelling windrow(s) based on a specific time frame.

Number of windrows and windrow height are important and are determined by litter depth. A litter depth of three to six inches usually works best.

Strategic timing of insecticide application is necessary for maximum beetle kill.

Ventilation should be continuous from harvest to pre-heating.

Windrows should be levelled at least four days before placement in order to allow litter to cool down and further dry out.

In most cases, paw quality can be improved if the litter can be kept relatively dry throughout the flock.

Windrow composting is a cost-effective method of litter management and disease control that can improve litter quality and extend the life of built-up litter. ■



## March.Industry News



### Rising Popularity of Poultry Meat

UK - Poultry accounts for more than 40 per cent of all meat that is eaten in the UK, whereas pork - the second most popular meat - accounts for 30 per cent, writes Chris Harris.

However, in some areas the poultry industry has to improve its communication to consumers about how poultry meat is produced, the welfare conditions used for rearing the birds and the safety of the products.

Speaking at the recent Agricultural and Horticultural Development Board Outlook Conference in London, Chris Dickinson from the National Farmers Union said that last year UK poultry producers produced 1.4 million tonnes of broiler meat – 35 per cent more than was being produced in the 1990s.

Turkey producers produced 189,000 tonnes of turkey meat and the UK is more than 80

per cent self-sufficient in poultry meat.

“After years of decline, the turkey industry has started to pick up,” Mr Dickinson said. However, he added that while the country is largely self-sufficient there is a large carcass imbalance that means the industry has to import breast meat and export the dark meat. Most of the imports come from Continental Europe.

Globally, he said that poultry meat consumption is growing more than in any other sector and by 2021, it is expected to overtake pork as the most widely eaten meat

About three-quarters of the British poultry sector is integrated and these integrated companies attempt to control their feed costs, which can be up to 65 per cent of the cost of production, by entering into feed tracker contracts.

“With tracker contracts, poultry producers



have more confidence,” he said. “But feed price volatility is something we have to live with.”

In all, 943 million broiler chicks are placed each year and the slaughter figures that have been rising rapidly since the 1990s have now reached 902 million birds.

Most of the industry is also producing either standard or standard plus birds that have a stocking density of 38kg per square metre. These birds reach a slaughter weight of about 2.4kg in about 40 days with an average weight gain of 60g a day.

A total of 14 per cent of the industry is higher welfare birds that are produced for supermarket chains such as Waitrose and Marks and Spencer.

These birds are slower growing, putting on just 45g a day and have an enriched environment for growing on.

Just three per cent of production is free-range and one per cent is organic.

Mr Dickinson said he did not foresee the free-range poultry meat market growing in the same way as the free-range egg market has grown in the UK because he said it is more difficult to raise a free-range bird.

The main factors that are driving growth in the poultry meat sector are a combination of rising demand together with the fact that the sector is unsubsidised and well integrated in the UK.

However, the cost of building a new poultry shed of about £500,000 for a 40,000- or 50,000-bird house means that the farmer has

to see a good return on investment.

Because of the integration in the sector, many arable farmers are now also looking to diversify into mixed poultry farms because there are opportunities for growth and there is a quick turn-around.

Mr Dickinson said that to see the sector growing, the producers have to ensure there is a good public image and perception of production methods.

“We have to push the welfare aspect and the care and attention given to the birds, even in a 40,000- or 50,000-bird sheds.”

Another aspect that needs to be addressed to ensure a good public image is the challenge of *Campylobacter* in poultry meat.

He said that the Food Standards Agency is making *Campylobacter* a priority and the industry is looking at ways at reducing contamination such as freeze blasting the carcasses, although even this does not eradicate the problem entirely.

Another concern is the threat of antibiotic resistance but he said there is also a great misunderstanding among consumers about resistance, antibiotics and the use of vaccines.

He said that human use of antibiotics in the most important contributor of AMR in human pathogens but assurance schemes are at present tightening their codes on medicines and reporting and the UK poultry sector is working with the Responsible Use of Medicines in Agriculture organisation (RUMA) to reduce use and inform the public about their use.

## Broilers and Turkeys: Original XPC Versus Campylobacter

US - New research from Diamond V shows its Original XPC product is effective against *Campylobacter coli* in broilers and turkeys, as well as improving feed conversion in the live birds.

Campylobacter is a leading cause of food-borne illness. Traditional contamination control focuses on meat processing. However, if producers can control *Campylobacter* colonisation in the birds' intestinal tract, prior to slaughter, then there is likely to be a reduction of contamination of processed birds.

Research shows that the functional metabolites in Diamond V Original XPC™ directly impact innate immunity by increasing natural killer cell activity and lysozyme activity, while

reducing IFN-gamma production. Adaptive immunity is also impacted as shown by higher levels of secretory IgA and increased antibody titre levels following vaccination.

Recent independent studies in broilers and turkey hens used a *Campylobacter coli* challenge to evaluate the effects of Original XPC on *C. coli* colonisation and transmission.

The research showed:

Feeding Original XPC improved broiler and turkey feed conversion at market age.

Feeding XPC reduced *Campylobacter* load (MPN or cfu) in horizontally challenged birds. Adding XPC at 2.5 lb per ton lowered incidence of *C. coli* isolated from commercial broilers at 42 days of age.



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The incidence and load of *C. coli* were reduced at 12 weeks of age in XPC-fed turkeys.

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For updates on ongoing poultry research, subscribe to 'PoultryAdvisor' at

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## Demonstrating Halamid Effectiveness with Dipslide

FRANCE - Axcentive is suggesting to all authorised distributors of Halamid® that they use dip slides as a simple test for the presence of micro-organisms before and after disinfection.

Manufacturers of disinfectants and their distributors are continuously promoting their products around the world in an effort to persuade users that their product is effective or superior to whatever is currently being sprayed in the poultry barn. Users of disinfectants have healthy scepticism about the latest wonder-formulation and the onus is rightly on the seller to demonstrate quickly and unambiguously during a trial that the product lives up to expectations.

To this end, Axcentive is suggesting to all Halamid® authorised distributors the use of dip slides which give a simple test on the presence of micro-organisms before and after disinfection. With some dip slides, it is even possible to measure specific bacteria (e.g. Salmonella, *E. coli*). Using a small portable and cost-effective incubator, results are available in 24 hours.

## Increase the value of animal feed

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- Maximizing the energy density of poultry rations
- Reduce feed costs
- Increase nutrient digestibility
- Reduce waste



Dipslides have been used to great effect since launching Halamid in Malaysia, which is a particularly competitive market for poultry disinfectants.

Dr Jolene Poo of F.E. Venture, Halamid's distributor in Malaysia, commented: "Using dipslides has really helped us prove, without doubt, the good performance of Halamid to many poultry farmers.

"We typically take samples during the day of the trial and incubate them upon arrival at the lab. The results are ready the very next day so the customer gets the feedback quickly while their interest in the product is still high – and some of them are so impressed that they start buying straight away!"

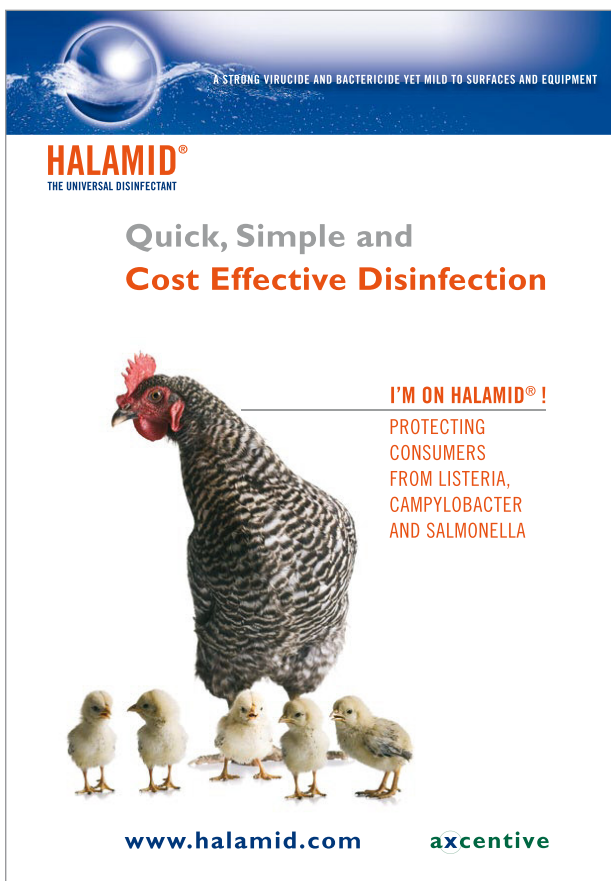
Further information, recommended equipment suppliers and full guidelines for the use of dipslides within a Halamid disinfection pro-

ocol can be obtained from local Halamid distributors or by contacting Axcentive (Tel: +33 (0) 442 694 090 or email [info@axcentive.com](mailto:info@axcentive.com)).

## Knowing What is in Medicated Feed Just Makes Sense

UK - Animal feed processors and meat producers can increase confidence in food safety by testing for drug residues at the point of feed supply according to Randox Food Diagnostics.

A leading food testing technology company, Randox Food Diagnostics specialises in developing and manufacturing drug residue screening technology across a variety of food groups including poultry and other meat products, honey, dairy and grain. They have developed an extensive range of tests for



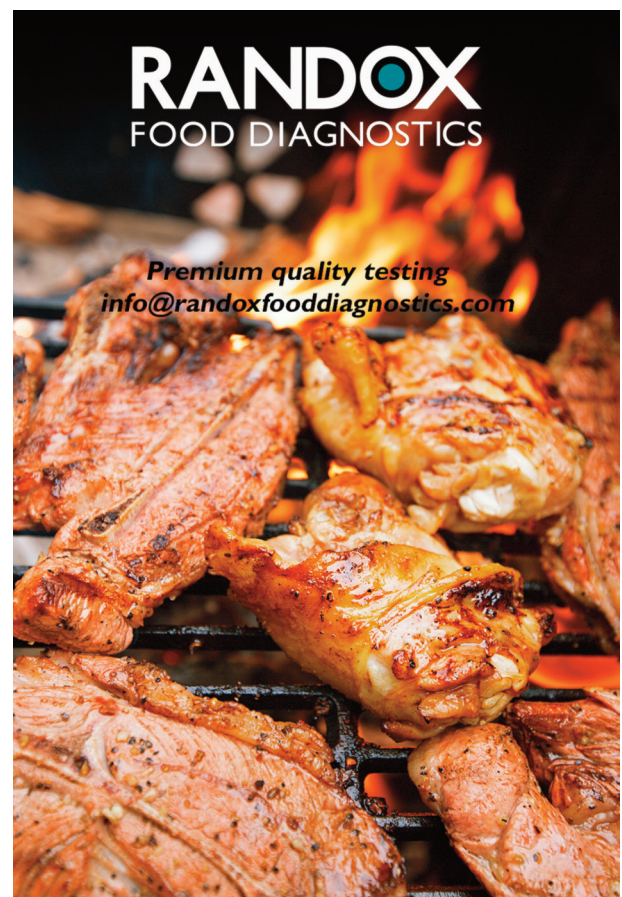
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drugs used in poultry production including those commonly administered such as streptomycin, sulphonamides, quinolones and tetracyclines.

Radox Food Diagnostics Meat & Seafood Manager, Joanne McKnight, said: "For disease control, particularly in high-volume populations such as poultry flocks, many producers administer feed pre-treated with antibiotics.

Both Radox Food Diagnostics high-performance ELISAs and ground-breaking Biochip Array Technology allow for the detection of antibiotics in both meat and feed.

"As the issue of antibiotic resistance becomes increasingly acute, we know producers are looking for better safeguards against contravening maximum residue limits. Using feed in which they can have demonstrable confidence is one way they can market the quality

and safety of their produce. As the first step in the production process, knowing the levels of antibiotics being administered to flocks in feed just makes sense," said Ms McKnight.

---

## New Production Systems Boost Poultry Production in India

INDIA - Government of India working with the state governments is encouraging many small families to start poultry farming to enhance the eggs and chicken production, according to Indbro.

This initiative is considered essential for the food security in less developed countries where the availability of inputs is low and the reach is difficult.

Chicken production is being augmented using backyard poultry systems and dual-purpose birds, which are improved breed crosses that are multicoloured and thrive on low inputs.

These birds are robust and grow faster. The male birds are about 1.5kg in 50 days and can be used for meat.

The female are capable of laying 160 to 180 eggs on scavenging and left-overs. The chicken meat thus produced is tougher than from broilers but lean and delicious.

The beneficiaries looking for more eggs are opting for coloured layer hens, which are smaller in size but lay above 250 eggs with low inputs and go up to 300 eggs if reasonable quality feed is provided and reared in small confined groups.

The main concern of the system is poultry

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health and biosecurity. Vaccination programmes suited to each area are well established.

Equipment for feeding and watering the birds is also available at a reasonable price. Cages and nipple drinking systems are well suited for small units.

This is seen as the second stage in backyard poultry farming. Meat is produced in cluster units. Each village will encourage each of eight or 10 people to have a small poultry house in their own property.

Birds are kept in an all-in, all-out basis in each house in rotation so birds are available from one house each week. Vaccination is done as necessary.

Females destined for the layer flock are reared in a single unit up to 14 weeks of age, again with vaccination, as required.

A single layer unit has between 50 and 500 birds, housed in cages. Once the vaccinated, birds start laying and they lay eggs for a year. Poultry manure is used as fertiliser for crops.

The eggs are sent to hospitals and schools in the same community.

So far, eggs and chicken have been moving from urban areas to rural areas, generating a reverse flow of poultry products.

The Rainbow Rooster, a multicoloured dual-purpose chicken developed by Indbro Research & Breeding Farms Pvt. Ltd is successfully meeting the needs for cluster rearing, while its brown layer suits the requirements of the family laying units.

## High Performance, Efficiency with Safety as a Bonus from Termotecnica

ITALY - Termotecnica Pericoli a brand recognised for its unquestioned quality, performance and efficiency is also highlighting the many safety features incorporated in their extensive range of fans, in particular the EOS/EWS range.

Easy access to the motor, belts, pulleys and propellers is very important in facilitating service and maintenance but so is the safety aspect. The Pericoli double opening wire guard on the air inlet side is hinged with an easy to open safety latch providing access and safety all in one. Couple this to the standard EU features and safety guards on the motor, pulleys and v-belts Pericoli also offers as an option a discharge guard, which covers the exhaust side shutters.



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These shutters can be operated with either of the Pericoli patented mechanisms, the lever or the highly efficient and quite centrifugal system, unlike any alternative system on the market. They are both durable and have an extended service life, contributing significantly to the fans overall performance and cost efficiencies.

Termotecnica Pericoli is a global market leader specialising in climate technology since

1967 in the design, manufacture and distribution of efficient/quality heating, cooling and ventilation equipment and systems for the livestock, agricultural and Industrial sectors, with a full range of products to meet all specification and applications.

For more information in the product brochure, visit:

[www.pericoli.com/inglese/EOS\\_EWS\\_EOC\\_english.pdf](http://www.pericoli.com/inglese/EOS_EWS_EOC_english.pdf).

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## Exclusion Grilles: Key to Good Manners

UK - The use of exclusion feeders in the broiler breeder house is now essential for male and female body weight control throughout production, according to Aviagen. Good manners make for better results.



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When it comes to poultry encouraging both males and females to have good feeding manners through the use of well-maintained separate sex feeding equipment is a vital tool for securing good flock performance.

broiler breeder male female feeding Aviagen Mark Wright, Regional Technical Manager, Aviagen Asia Pacific, explained: “The use of exclusion feeders in the broiler breeder house is now essential for male and female body weight control throughout production. Feed stealing by either sex will have a significant impact on egg numbers and fertility within the flock.”

In the 2013 'Parent Stock Handbook', Aviagen increased the height and width recommendations for exclusion grills on female feeders to account for progress in genetics and bird performance. Recommended grill height is now 60mm (increased from 50-55mm) and width is 47mm (increased from 45-47mm). These increases will ensure females can access the feed while preventing the males from stealing feed.

Complete exclusion of all males from the female feeders normally occurs around 26 weeks of age. Up to this point, some males may still be able to access the female feeding system and steal female feed. Careful monitoring of bodyweight and feeding behaviour is necessary at this time to ensure that both males and females are receiving enough feed to maintain target increases in bodyweight.

Early in production, a plastic pipe can be inserted into the apex of the grill to exclude immature males. The plastic pipe can be removed after 33 to 35 weeks of age.

Feeding equipment must be properly ad-

justed and maintained; daily inspections of female feeders should be made. Poorly managed and badly maintained feeding equipment gives uneven feed distribution, which is a major cause of depressed egg production and fertility.

For more information, contact Aviagen by email [info@aviagen.com](mailto:info@aviagen.com) or its web site, [www.aviagen.com](http://www.aviagen.com).

## Russia Planning to Increase Annual Poultry Meat Production by 2020

RUSSIA - Russia plans to produce more than six million tonnes of poultry meat per year by 2020 according to a statement from the Ministry of Agriculture's press office.

Russia plans to produce more than s million tonnes of poultry meat per year by 2020, ac-

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cording to a statement from the Ministry of Agriculture's press office.

According to data from the Russian Federal State Statistics Service (Rosstat), the production level of poultry meat in the previous year was 5.1 million tonnes live weight, or 42 per cent of the country's total meat output. Most of this production was broiler meat. Poultry meat imports accounted for only ten per cent. The statement also mentioned that investments in the Russian poultry industry have reached more than RUB300 million in the last few years. This has allowed more than 400 facilities in the sector to modernise and upgrade.

The Russian poultry meat market has recently been showing an upward trend in the share of chilled poultry meat to about 50 to 60 per cent of the overall production level. Large industrial facilities for the production of non-tra-

ditional poultry breeds like turkeys and Peking ducks also started up in the same period.

The Ministry of Agriculture adds that annual per-capita poultry meat production is currently 26.6kg, while consumption is 29.3kg.

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## Odisha Bids to Raise Egg Production to Meet Demand

INDIA - Even as Odisha state has recorded a 10 per cent growth in egg production, there is still a huge gap between demand and supply.

According to The New Indian Express, as per normative calculation, there is a demand of around 64 lakh eggs per day in the State. The domestic production of egg is about 45 lakh including 34 lakh from 61 commercial layer farms.

Under the supplementary nutrition programme, around 15 lakh eggs are required for the Integrated Child Development Scheme (ICDS) and 13 lakh for mid-day meal programme on daily basis.

The gap in the demand and supply is met by procuring around 20 lakh eggs from neighbouring Andhra Pradesh, official sources said adding the annual per capita availability of egg in Odisha is 56 as against the national average of 55.

Considering this requirement, the State Government has planned to increase egg production through commercial farming and backyard poultry. The Government has announced capital subsidy of 40 per cent to attract more private investment in this sector.

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The capital investment subsidy will be raised to 50 per cent for women, scheduled category entrepreneurs and graduates in agriculture and allied disciplines, the sources said.

Issues confronting poultry farming were discussed at a high level meeting chaired by Chief Secretary JK Mohapatra here recently.

It was decided at the meeting that the issues relating to reimbursement of VAT and entry tax for layers poultry farms will be dealt expeditiously.

Since poultry has been recognised as an agricultural activity, the meeting decided to treat it at par with agriculture with regard to land use and power tariff matters.

The Chief Secretary asked the Revenue and Disaster Management department to issue necessary instructions clarifying that conver-

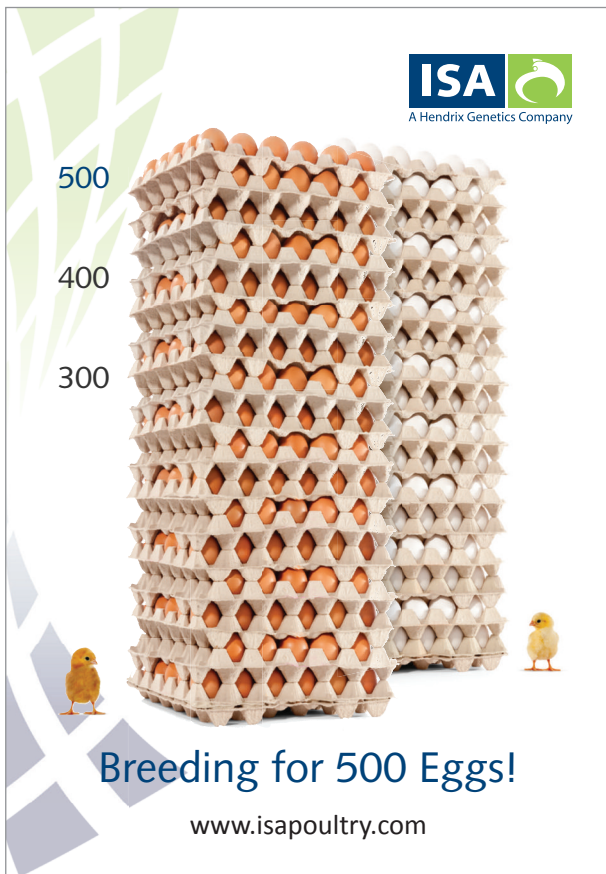
sion of agricultural land to homestead land may not be necessary for setting up layer poultry farms.

The Energy department was asked to take up the tariff related matter with the Government.

Meanwhile, the Panchayati Raj and the Fisheries and Animal Resources Development (F&ARD) departments have developed a model plan to rope in women self help groups (WSHG) to enhance egg production to 100 laks per day in coming years.

The F&ARD department has been directed to promote establishment of maize processing units in the State to produce poultry feed.

These activities will generate employment opportunities and provide permanent livelihood support to farmers.



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### El Niño está de regreso

Se pronostica un evento climático de El Niño este año, lo que debería crear las condiciones ideales de crecimiento de los cultivos en los Estados Unidos pero un clima más seco en Brasil, Australia, India y China. Escribe Chris Wright, editor principal de El Sitio Avícola.

"El agua caliente se está acumulando en la costa del noroeste de EUA, el agua está alrededor de 2-3° C por encima de lo normal y esas son las condiciones que crean El Niño", dijo el Dr. Art Douglas, profesor emérito de la Universidad de Creighton, EUA.

"En Suramérica, se puede ver que el agua se está calentando frente a las costas de Perú y Ecuador. Esta es la primera fase de El Niño que está desarrollando a través del ecuador", indicó el Dr. Douglas.

La siembra de maíz en Estados Unidos podría retrasarse debido al exceso de humedad, mientras que las temperaturas en el Medio Oeste deben permanecer más cálidas de lo normal a través de la primavera.

"Con el desarrollo de El Niño se espera un clima más seco en los próximos seis meses en Brasil, Australia y la India. Argentina debe ver una mejoría lenta en las condiciones de humedad según se acerca el invierno", concluyó Douglas.



## **México: estrategia contra influenza H7N3**

Luego de que el Servicio Nacional de Sanidad, Inocuidad y Calidad Agroalimentaria (SENASICA) levantara el 26 de febrero la cuarentena interna impuesta a Guanajuato en febrero de 2013 por la presencia del virus de influenza aviar de alta patogenicidad AH7N3, la institución anunció que el próximo 10 de marzo arranca la estrategia final para lograr la erradicación del virus del territorio nacional.

De acuerdo con la instrucción del titular de la Secretaría de Agricultura, Ganadería, Desarrollo Rural, Pesca y Alimentación (SAGARPA), Enrique Martínez y Martínez, el objetivo es que en 2015 México esté listo para solicitar a los organismos internacionales competentes el reconocimiento como país libre, después de haber eliminado las últimas aves vacunadas.

Hizo hincapié sobre la necesidad de trabajar juntos para perfeccionar los sistemas de movilización, buenas prácticas pecuarias, y de bioseguridad en las granjas, a fin de lograr la erradicación del virus.

De igual manera, apuntó, es necesario que los productores busquen nuevas formas para la disposición segura de las aves de desecho, la gallinaza y la pollinaza y para elevar los niveles de bioseguridad en sus granjas.

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## **Colombia protesta por contrabando de pollo**

Por lo menos 1,400 toneladas mensuales de carne de pollo entran al país de contrabando, procedentes de Venezuela, denunció Andrés Valencia, presidente de la Federación Na-

cional de Avicultores de Colombia (Fenavi).

El dirigente gremial destacó que este delito ha logrado impactar más del 50% del mercado que pertenecía a las empresas avícolas de la zona y a las de otras regiones que venden allí.

El gremio avícola destacó que el contrabando de huevo en la frontera con Ecuador preocupa a la industria nacional por los inminentes riesgos que representa. Se estima que diariamente ingresan al país más de 400,000 unidades de huevo por Ecuador.

---

## **Influenza aviar en Asia: de mal a peor**

Los brotes de influenza aviar, de varias cepas, siguen aumentando tanto en frecuencia como en el número de países que los padecen.

El mes de febrero ha visto un alarmante incremento de los problemas en influenza aviar en tres países. Queda claro que las autoridades de sanidad animal en Asia están frustradas al no poder controlar la enfermedad.

En breve: en China siguen aumentando los casos de humanos infectados con influenza aviar H7N9 y, además, hubo otro caso mortal de H10N8; Vietnam informó de más brotes de influenza aviar H5N1 y Corea del Sur intenta controlar la influenza aviar H5N8.

# Enfermedades de aves de traspatio en México

Estas investigaciones fueron presentadas durante la Convención de la Asociación Mundial de Veterinarios Aviares (WVPA) que tomó lugar en Nantes, Francia, en agosto de 2013.

## Aislamiento de virus respiratorios en aves de traspatio

En una presentación oral de un equipo de investigadores de la Universidad Autónoma de Yucatán (UADY), México, se indicó que es común que se críen pollos en las comunidades rurales del estado de Yucatán. Las enfermedades respiratorias se encuentran entre las más importantes en aves de traspatio (Gutiérrez-Ruiz et al, 1998). Por eso se decidió aislar y caracterizar los virus respiratorios de aves que afectan a aves de traspatio en Yucatán.

Se obtuvieron 168 muestras cloacales y 146 muestras traqueales de 120 pollos centinela de 130 casas en 30 comunidades seleccionadas al azar.

Se usó la prueba de inhibición de hemaglutinación para la tipificación de virus según describe Alexander, et al (1983).

Las cepas de referencia de bronquitis infecciosa fueron: Massachusetts 41, Arkansas 99, Connecticut, SIN6/YUC/MEX/96 y UADY/YUC/MEX/97. Todas estas cepas se han reportado en México previamente.

Las relaciones antigénicas se calcularon como describen Archetti y Horsfall (1950).

No se detectaron virus hemaglutinantes. Por eso se descartó la presencia de la enfermedad de Newcastle y la influenza aviar, confirmando el estatus de Yucatán como estado libre de estos virus.

Se obtuvieron cuatro virus de las comunidades de Muna, Xcucul, Tamchen y Pencuyut. Los virus aislados de Xcucul y Pencuyut tuvieron un R del 100% entre ellos y fueron similares a SIN6/YUC/MEX/199.

Muna tuvo un R del 50% con

UADY/YUC/MEX/97. Tamchen tuvo un R del 100% con Massachusetts 41.

Se obtuvo un virus tipo Massachusetts, algo esperado ya que es una cepa que se usa en las vacunas que se utilizan para inmunizar aves comerciales en Yucatán.

Durante los últimos 14 años parece que la cepa SIN6 se ha transmitido a más comunidades, probablemente a través del movimiento de aves vivas.

En el caso de la cepa UADY, se aisló a partir de una comunidad a pesar de que este virus fue aislado originalmente de una parvada de pollos de cuello desnudo mantenido en la FMVZ-UADY con fines de conservación del gen. Muchas aves que provenían de esta parvada se vendieron a otros individuos.

### **Prevalencia de parásitos internos y externos en aves de traspatio**

El mismo grupo de investigadores de la Universidad Autónoma de Yucatán, hizo una presentación de cartel mostrando los resultados de una segunda investigación.

Las familias de las comunidades rurales en México comúnmente reportan trastornos respiratorios y digestivos como las principales causas de pérdidas de aves de traspatio.

Se han realizado pocos estudios para estimar el verdadero impacto de los parásitos en las comunidades rurales de México.

Con el fin de determinar la prevalencia de parásitos internos (helmintos gastrointestinales y protozoarios) y externos, los parásitos externos y las muestras de heces se obtuvieron de 129 pollos centinelas introducidos

en ocho comunidades rurales del estado de Yucatán.

Cinco de las comunidades estudiadas se encuentran en la costa y tres en el centro del estado. Utilizando flotación centrifugada y técnicas de McMaster se llevó a cabo la identificación y cuantificación de huevos y ooquistes eliminados por gramo de heces. Los parásitos externos fueron clasificados taxonómicamente.

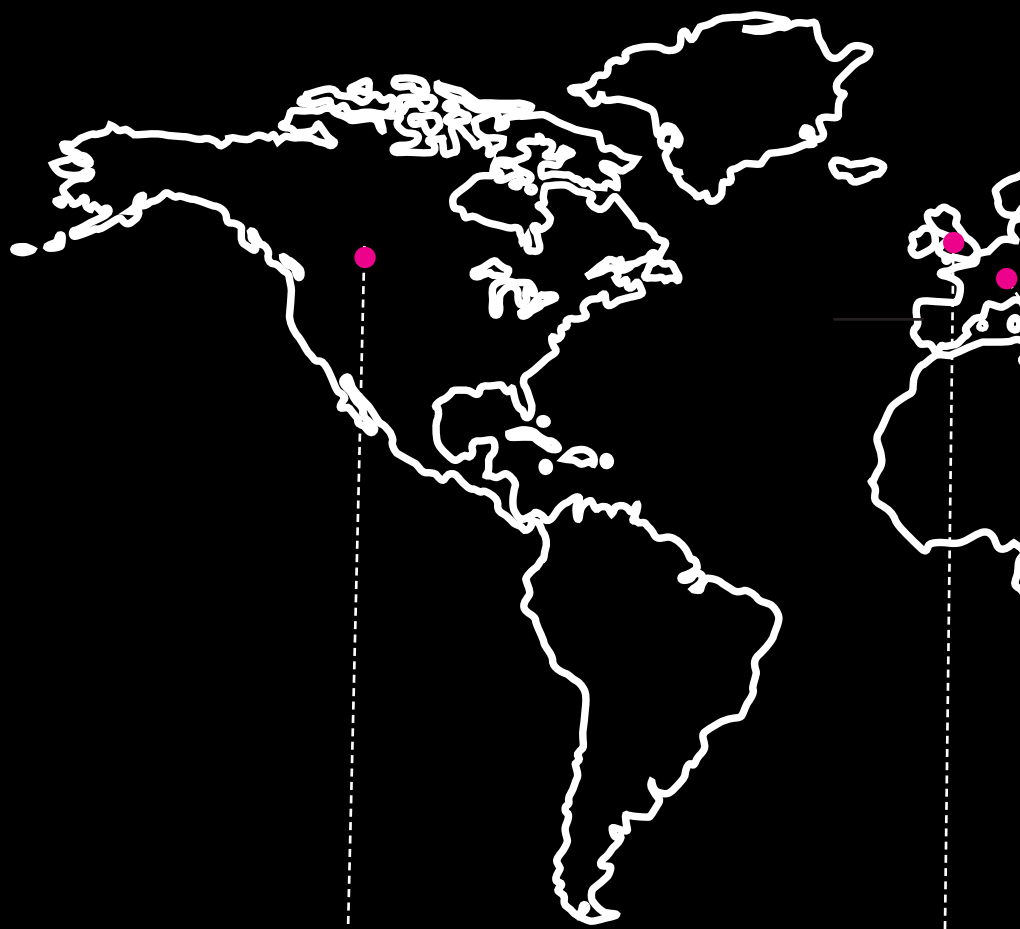
La prevalencia global de parásitos internos y externos fue de 77% y 79%, respectivamente. La prevalencia por género y / o especie se determinó también. El parásito gastrointestinal más frecuente fue el protozooario de la subclase *Coccidia* con el 70.8%. También se identificaron ectoparásitos. El ectoparásito más prevalente fue *Menacanthus stramineus*, el piojo del cuerpo del pollo, con una prevalencia del 58%.

Se detectó una diferencia estadísticamente significativa en la prevalencia de algunos parásitos internos entre las aves de comunidades localizadas tierra adentro en comparación con las aves de comunidades situadas en la costa. Esto podría estar relacionado con las diferentes condiciones del suelo, como el pH y la salinidad, pero se necesitan más estudios para determinarlo.

Algunas condiciones como la humedad, la temperatura y la densidad de las aves, pueden favorecer la transmisión de parásitos entre los pollos y otras especies que afectan a la productividad de las aves de traspatio, donde rara vez se reportan medidas de control de parásitos. ■



# Industry.Events



**Livestock Care Conference 2014** ●  
**Edmonton, Alberta, Canada**  
**26 to 27 March**

Alberta Farm Animal Care is partnering with the Alberta Veterinary Medical Association to host the 2014 Annual Livestock Care Conference (LCC).

This conference provides an opportunity for researchers, industry, students, government and the public to address challenges and trends in animal care.

**Turkey Science and Production** ●  
**Conference 2014**  
**Chester, UK, 26 to 28 March**

Last year's event attracted more than 240 delegates from over 22 countries and provided an excellent opportunity to learn about turkey developments, do business and make new friends.

The 2014 Conference is the 8th of these conferences, formerly the 'Technical Turkeys' conference.



**International Egg Commission's ●  
Vienna 2014 Conference  
Vienna, Austria, 30 March to 1 April**

International Egg Conferences invites you and your colleagues to their annual Business Conference taking place in Vienna this March, where you can meet with leading decision makers and experts in the international egg industry.

**VIV/Ildex India 2014 ●  
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The Aviagen Group is the global market leader in poultry genetics. As the world's premier poultry breeding company, Aviagen develops pedigree lines for the production of commercial broilers and turkeys.



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### Novogen

Tel: +33 296 58 12 60  
Fax: +33 296 58 12 61  
contact.novogen@novogen-layers  
www.novogen-layers.com

#### Areas:

Breeding  
Genetics

NOVOGEN offers a new alternative giving the egg producers more choice and possibilities to fit their specific market requirements.



### Indbro Poultry

Tel: +91(40) 24145594  
drkotaiah@indbropoultry.com  
www.indbro.com

#### Areas:

Breeding  
Genetics

Started off as a Broiler breeding company, with pure line birds developed and bred under Indian Climate, feed & management since 1990.

## Biosecurity & Hygiene



### CID LINES

Tel: +32 5721 7877  
Fax: +32 5721 7879  
info@cidlines.com  
www.cidlines.com

#### Areas:

Biosecurity  
Cleaning  
Feed: Additives  
Health and Safety  
Pest Control  
Welfare

CID LINES offers VIROCID, the most powerful disinfectant, which is part of a hygiene program for poultry, written by hygiene specialists. VIROCID has a proven record in preventing and fighting disease outbreaks for many years.



### PCS Poultry Services

Tel: +44 (0) 1386 701 812  
Fax: +44 (0) 1386 701 376  
admin@pcspoultry.com  
www.pcspoultry.com

#### Areas:

Biosecurity  
Hygiene  
Cleaning Services  
Pest Control

FOSSIL SHIELD + PCS Poultry, the solution to your red mite problem. Unique professional on-site electrostatic application with Fossil shield, a non-toxic natural diatomaceous powder.



### AB Vista

Tel: +44 (0) 1672 517650  
Fax: +44 (0) 1672 517660  
info@abvista.com  
www.abvista.com

### Areas:

Feed  
Feed: Additives  
Feed: Nutrition

AB Vista is an integrated international supplier of new generation micro-ingredients for animal feeds providing visionary solutions for your agribusiness.



### Biomim

Tel: +43 2782 803 0  
Fax: +43 2782 803 30  
office@biomin.net  
www.biomin.net

### Areas:

Feed  
Feed: Additives  
Feed: Nutrition

BIOMIN offers sustainable animal nutrition products such as quality feed additives and premixes, which include solutions for mycotoxin risk management, a groundbreaking natural growth promoting concept as well as other specific solutions



### Danisco Animal Nutrition

Tel: +44 (0) 1672 517777  
Fax: +44 (0) 1672 517778  
info.animalnutrition@dupont.com  
www.animalnutrition.dupont.com

### Areas:

Feed: Additives

Danisco Animal Nutrition (part of DuPont) is a leading global supplier of enzymes, natural feed betaine, probiotics and essential oils to improve the nutrition of poultry, pig, ruminant and some aquaculture species. Our mission is to develop sustainable solutions that further decrease feed costs, increase animal productivity and reduce environmental impact.



### Global Bio-Chem

Tel: +1 2838 8155  
Fax: +1 2838 8433  
contact@globalbiochem.com  
www.globalbiochem.com

### Areas:

Feed  
Feed: Additives

Global Bio-Chem is the largest producer of Lysine worldwide and pioneers of corn refined and corn based products. Our products are utilized in feed products, food, beverage, cosmetics, textiles, pharmaceuticals and chemicals industry worldwide.



### Kerry Ingredients & Flavours EMEA

Tel: +31 36 523 3100  
Fax: +31 36 523 3110  
clive.girdler@kerry.com  
www.kerry.com

### Areas:

Feed  
Feed: Additives  
Feed: Safety

Kerry Ingredients & Flavours is a leader in developing, manufacturing and delivering technology-based ingredients and integrated solutions. Our products are designed specifically to optimize the nutritional value and maximize the energy of feed ingredients in poultry diets.



### Novus International

Tel: +1 314 576 8886  
Fax: +1 314 576 2148  
contact@novusint.com  
www.novusint.com

### Areas:

Feed  
Feed: Additives  
Feed: Nutrition

Novus International is a global leader of animal health and nutrition programs for the poultry, pork, beef, dairy aquaculture and companion animal industries.

## Housing & Equipment

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### AgriLamp

Tel: +44 (0) 1332 547 118  
Fax: +44 (0) 208 439 1538  
info@agrilamp.com  
www.agrilamp.com

#### Areas:

Equipment: Lighting & Electrical

AgriLamp™ is a leading LED manufacturer with years of experience in designing and manufacturing the world's most innovative LED (light-emitting diode) lighting solutions for the agricultural industry.



### Big Dutchman

Tel: +49 4447 801 0  
Fax: +49 4447 801 237  
big@bigdutchman.de  
www.bigdutchman.com

#### Areas:

Equipment: Breeding  
Equipment: Drinking  
Equipment: Egg  
Equipment: Feeding  
Equipment: Weighing

The poultry equipment supplier for layer management, breeder management, poultry growing and poultry climate control.



### Termotecnica Pericoli

Tel: +39 0182 589006  
Fax: +39 0182 589005  
termotecnica@pericoli.com  
www.pericoli.com

#### Areas:

Climate Control  
Climate Management  
Heating, Cooling and Ventilation

A global market leader specializing in climate technology since 1967 in design, manufacture and distribution of efficient/quality heating, cooling and ventilation equipment and systems for the poultry industry with a full range of products to meet all specification and applications.



### Vencomatic

Tel: +31 (0) 497 517380  
Fax: +31 (0) 497 517364  
info@vencomatic.com  
www.vencomatic.com

#### Areas:

Equipment: Breeding  
Equipment: Drinking  
Equipment: Egg  
handling and grading  
Equipment: Nesting

Vencomatic is a global supplier of innovative and welfare friendly housing solutions for the poultry sector. The flexible and turn key solutions of Vencomatic offer large possibilities for a wide range of poultry production concepts.

## Incubation & Hatching

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### Orka Food Technology

Tel: +852 8120 9245  
Fax: +852 2802 7112  
info@orkatech.com  
www.eggtester.com

#### Areas:

Equipment: Egg  
Equipment: Hatching  
Equipment: Incubation

EggTester.com (officially known as "Orka Food Technology") is a leading worldwide manufacturer of egg-quality testing equipment to be used extensively in QC laboratories operated by egg producers, packers, universities, regulatory authorities, and primary breeders.



### Pas Reform

Tel: +31 314 659 111  
Fax: +31 314 652 572  
info@pasreform.com  
www.pasreform.com

#### Areas:

Equipment: Incubation  
Equipment: Egg  
Equipment: Environment  
Equipment: Hatching  
Waste Handling

Pas Reform is an international company, which has specialized in the development of innovative hatchery technologies for the poultry sector since 1919. Products and Services: Incubators, Hatchery Automation Systems, Hatchery Climate Control Systems and Hatchery Management Training.





### Petersime

Tel: +32 9 388 96 11  
Fax: +32 9 388 84 58  
info@petersime.com  
www.petersime.com

### Areas:

Equipment: Hatching  
Equipment: Incubation

Petersime is a world leader in the development of incubators, hatchery equipment and turnkey hatcheries.

## Events & Exhibitions

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### VIV

Tel: +31 30 295 28 98  
viv@vnuexhibitions.com  
www.viv.net

### Areas:

Events & Exhibitions

With 7 VIV exhibitions all over the world VIV trade exhibitions are recognized for high trade quality in the professional industry. With over a 1,000 international companies exhibiting and visitors from over 140 countries the VIV-shows are also considered as very international.

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