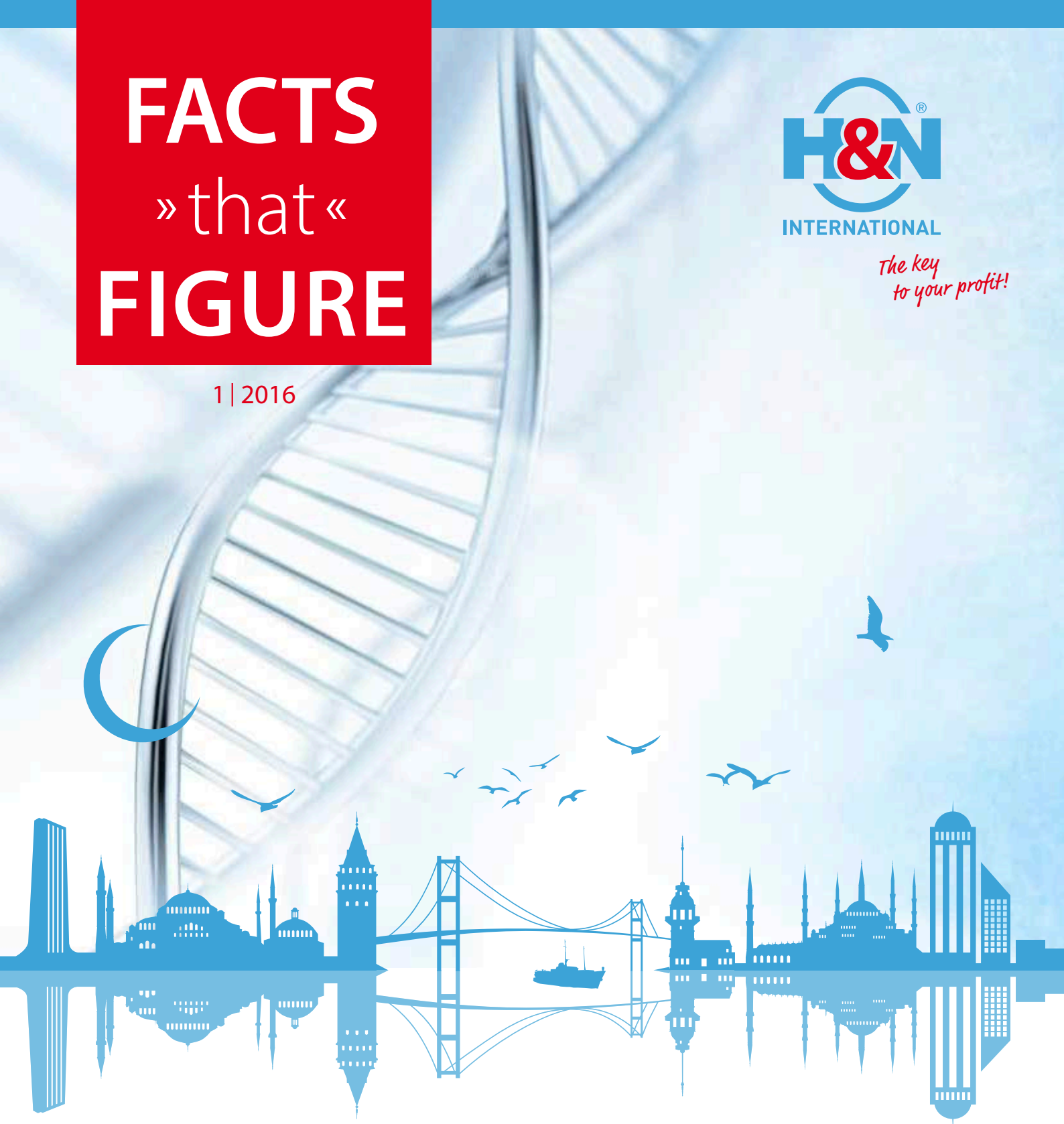


FACTS » that « FIGURE

1 | 2016



*The key
to your profit!*



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Dear valued customers and partners,

On behalf of the team at H&N International, I would like to take this opportunity to warmly welcome our new customers to our family.

Continuous investments in our breeding programme and improvements to our infrastructure to supply our global customers have been the driving forces for an excellent and steady growth of H&N parent stock sales. The growth of our long-standing customers and the acquisition of several new customers on different continents have contributed to the rapid growth of H&N like never before.

Selection to meet different market needs and close collaboration with our customers to make our birds better with every generation, will attract even more customers, which by the way, are already touching base with us.

The team of H&N is highly committed in improving the genetic potential of our birds and also in delivering the necessary technical support to convert this potential into higher egg outputs and making your bottom line even better!

Prof. Dr. Rudolf Preisinger
Chief geneticist and managing director

Prof. Dr. Rudolf Preisinger



CP Malaysia resumes **IMPORTATION OF H&N CORAL PS**

Malaysia has one of the highest per capita egg consumption in the South East Asian region at 315 eggs according to the statistic released by Malaysian Department of Veterinary Services (DVS). Although the market is traditionally a brown egg market, there is a growing demand for tinted eggs amongst the Malaysian consumers.

In June 2015 this year, CP Malaysia resumes the importation of Coral PS from H&N International for their tinted eggs production after a 3 year hiatus. The H&N Coral layers stand for their excellent production and the most important aspect is the „ creamy“ egg shell colour that Malaysian consumers are willing to pay more for.

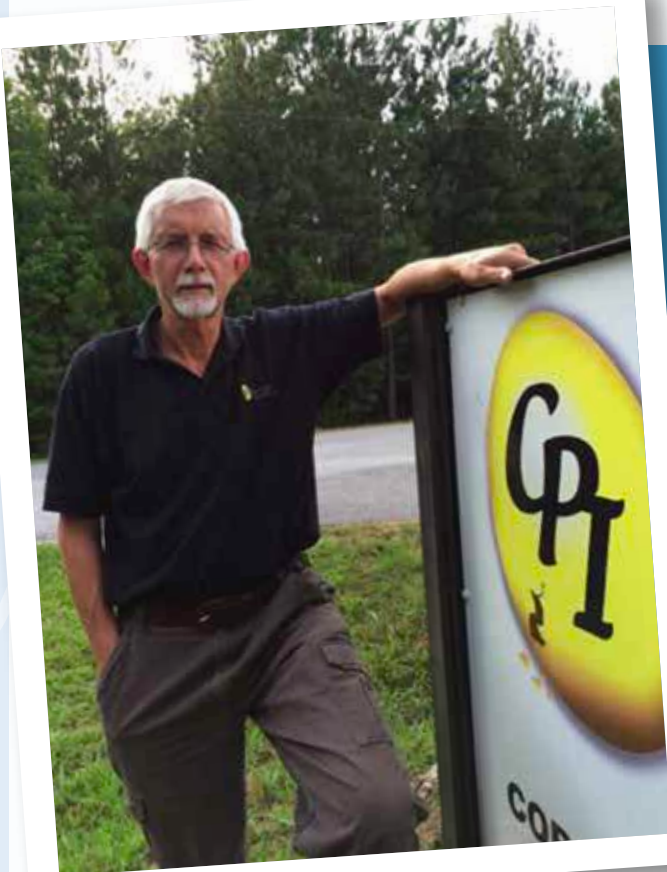
We at H&N are glad that CP Malaysia recognizes the quality that our breed has to offer.

Dr. Ling-Ling Chuah



Interview with **MR. GIJS SCHIMMEL,** President of **Centurion Poultry, Inc.**

Centurion Poultry, Inc. of Lexington, Georgia was appointed as a distributor for H&N 'Nick Chick' layers in the USA. This was announced in March this year. Rich Wall, of the H&N's Sales and Technical Service department, recently sat down with Mr. Gijs Schimmel, Centurion's founder and president, to discuss more about his company and his reasons for switching to 'Nick Chick'.



Centurion has been in business for nearly 25 years and during that time, it has established itself as the leading, independent producer and distributor of layer chicks in the US market. This has been achieved by providing top quality chicks on a consistent basis with solid customer support on a timely and meaningful basis.

Gijs, first of all, we at H&N welcome you to the global community of H&N distributors and we thank you for your decision to join us. As a start, please give us some details on the founding of Centurion, some key developments in the history of the company and its current activities.

"After Hypeco closed its business, the bank became the owner of the US assets. I was asked to help divest as the bank was not interested in continuing the US operation which had a history of being far from profitable ever since it was set up in 1984. Even though the company managed to sell the Bovans layer genetics; at that time the new owner had no interest in taking over the US operations.

Having had the opportunity to work on the restructuring of the operation, and with the bank willing to work with us in taking over what was left; Louise and I decided this was the right time to start a business of our own. We took over some of the farm and hatchery leases and leasehold improvements from the bank and made an agreement with the new owners of Bovans Genetics to bring grandparent stock to the US and become their North American distributor.

The first seven years in particular were tough years. I'm afraid one day my children will say the same about growing up as I did. In 1998 things

started to look brighter. Our company had rooted! We were able to establish a new farm on a nearly 750 acres (300 hectares) site in North Georgia, USA where our headquarters have been located ever since. Since then, we have added hatcheries and breeder facilities in Pennsylvania, Alabama and Iowa and currently we are supplying close to 20% of the layer chicks in the US."

It would also be interesting if you could provide us with some insight into your decision to change from your previous breed to 'Nick Chick'.

"Thank you for giving us the opportunity to distribute the 'Nick Chick' in the US. Over the years the vision between the genetics supplier and ourselves on how to continue growing our position in the US market slowly started to go in different directions. I think both parties tried hard to make it work; not in the least because of our shared history. But eventually a decision had to be made. The way I look at it is like a marriage. You are either married and are a team or you fail and are better off divorced.

We reached that point early this year and we decided it would be better if we would each go our own way. We have had many challenges over the years and we often turned them into opportunities! This change of suppliers for our genetics is no different. We are looking forward to turning this challenge of change into an opportunity to

build a sound, mutually beneficial relationship with the H&N team and make the H&N 'Nick Chick' layer leading again in the US market!"

The current Avian Influenza crisis in the United States is the worst in its history. Thus far, Centurion's facilities have not been affected. How would you briefly describe the steps you've taken to keep AI out of your farms and hatcheries?

"We have a 120,000 breeder complex and a hatchery with yearly production capacity of 18 million pullet chicks in the American mid-west. That is about a third of our company's total capacity.

Our mid-west operation is situated in an area in the state of Iowa with a high density poultry population. Although we have no other poultry in a more than 5 to 6 mile radius from our facilities, there were massive outbreaks less than 15 miles away which definitely made us uncomfortable. Fortunately, we have always had a very stringent biosecurity program featuring showers in facilities among its requirements.

Yes, the hatchery added fumigation of interior and washing the exteriors of chick trailers before returning from deliveries and also going through a truck wash just before delivering baby chicks to our clients. Our breeder farm is completely self-contained with its own growing houses and never using any con-

tract labour for moving, vaccinations or other chores. We had already implemented measures such as not allowing road vehicles on the premises and changing footwear twice (upon arrival after showering at the complex entrance and again before entering each individual unit from the outside). All Centurion employees must sign a statement which verifies that they don't have contact with any other poultry.

For us these are standard operating procedures so nothing is new to us. Other than adding high alerts to catch human errors in following the protocols, we really have not done much different from what we

normally do. Biosecurity lapses are always my main concern. I believe that generally egg producers have good biosecurity protocols, but it is all about implementation and constant surveillance. It may turn out that biosecurity lapses have been the main reason why the HPAI outbreak has become so massive!"

Recently, per capita egg consumption has risen rapidly in the US market. Taking the current AI crisis into consideration, how do you view the future of the US market going forward?

"Thank you for asking this 'million dollar question'. If only

we knew! Very few, if any, had expected the egg consumption in the US to increase as fast as it did in the past several years. The same goes for the fact that the HPAI outbreak did not change the public's perception of egg safety, or that the sharp increase of the price for eggs did not seem to have bothered the consumers.

The popularity of eggs is expected to stay high for other reasons as well. We lost roughly 10% of our egg layers in the USA due to HPAI. We will reduce or eliminate some exports, we likely will import some eggs, yet it cannot make up for the loss. My 'crystal ball' says it will take a very long time to re-populate





what was lost due to HPAI, because of limiting factors like pullet rearing space and chick availability. So an egg shortage coupled with good profitability for the producers for the remainder of 2015 and 2016 is very likely! But when the re-population is completed, 2017 and 2018 may be a different story ...

I think other countries have gone through such supply disruptions over time with the same outcome."

In closing, Gijs we thank you for your time and the insights you have shared with us.

Rich Wall



WRITING HISTORY WITH SUPER NICK

First batch of Super Nick parentstock shipped to Guatemala

In March 2014 history was made: the first batch of Super Nick parentstock day-old chicks was shipped to Guatemala. "A key moment for our future business", describes Dr. Ronald Trenchi of the Sales & Technical Service department for America.

To celebrate this joyful event, H&N International GmbH and its customer Industria Genética Avícola de Guatemala S.A. Compañía organized a Super Nick launch, which lasted a week. The Super Nick Chick was presented to associates of the big cooperative Comyma during a delicious breakfast. Then, both Super Nick – for the

production of white eggs – and Brown Nick – for the production of brown eggs, were introduced to the Guatemalan poultry industry. At both meetings exchanging technical information on the extraordinary production characteristics of H&N Super Nick was part of the programme. Also the clear possibilities to seek the best feed to cost ratio were pointed out. "It is our business to produce eggs of excellent quality at the lowest cost", explains Trenchi. "We aim to produce a uniform egg with an adequate weight. An egg that keeps its characteristics concerning size and shell

quality until he reaches the end of the life." In November the second Super Nick parentstock flock arrived, along with the first shipment of Brown Nick parentstock for the production of brown eggs. Trenchi: "We thank Industria Genética Avícola de Guatemala S.A. for the confidence put in H&N International and in our after sales service. We look forward to a long-term collaboration."

Dr. Ronald Trenchi



10,133 chicks, 1 shipment,
2 satisfied customers

BROWN NICK INTRODUCED ONTO BOLIVIAN MARKET

No less than 10,133 Brown Nick parentstock day-old chicks found their way to two leading companies in Bolivia in September last year. "The two companies, which both have a long tradition in Bolivia, introduced our Brown Nick onto the Bolivian market. Something to be proud of", says Dr. Ronald Trenchi, of the Sales & Technical Service department for America.

Ing. Humberto Arana, who was responsible for realizing the shipment of the 10,133 chicks by road all the way from Sao Paulo to Santa Cruz and Cochabamba, faced an interesting challenge. "But thanks to his effort

the transport of the chicks was a success, as the chicks were shipped under optimal conditions in only one shipment", emphasizes Trenchi. "The chicks reached the new customers in very good shape."

Avícola Rolon and Avícola Modelo, market leaders in the production of quality table eggs, have placed their confidence in H&N International. "And their trust will turn out to be well founded", says Trenchi, who has no doubt H&N's Brown Nick will reach their expectations, as the brand excels in egg quality and is known for its excellent shell and uniform colour as well as their very good

egg shell resistance. "Combining experienced businesses as Avícola Rolon and Avícola Modelo with our Brown Nick is a recipe for success on the Bolivian quality market."

Dr. Ronald Trenchi



LLC Oasis Agro empowers families in southern Kyrgyzstan

Small-scale egg farms improve lives

LLC Oasis Agro, based in southern Kyrgyzstan, focuses on producing the highest quality feeds in Central Asia and empowering local families to start and run their own highly productive, small-scale egg farms. Since its establishment in 2008, Oasis Agro has helped more than 200 families to start such businesses and receive a regular income from their activities.

Since its founding, Oasis Agro has been supplying Coral layer hens to the market. These hens are in high demand locally due to their durability and exceptional productivity. Initially, Oasis Agro imported Coral commercial chickens from Europe, but in August 2014 the company received its first Coral PS DOC from H&N International GmbH. They now manage Coral PS breeder hens and incubate their own eggs. The company seeks to export HE and DOC to hatcheries and layer houses throughout the region and invites any interested organization to get in contact (Website: www.npfsolutions.com).

Improving lives

In May 2015, the company sold its first group of more than 20,000 layer hens to 35 families who have established small egg-production enterprises in various regions of southern Kyrgyzstan. Around two-thirds of these families have already housed a flock in the past which they

previously bought from Oasis Agro. These families claim that producing and selling eggs has allowed them to improve their lives by helping them fund home repairs, send children to university or pay for a wedding.

Higher margins

For residents of Kyrgyzstan's southern regions it is still possible to start a small business in the poultry sector. Currently, over 30% of eggs consumed in Kyrgyzstan are imported from abroad; however, many locals prefer to pay a premium for eggs that are fresh and grown locally. In fact, cream-colored eggs that are grown locally demand an average of 2 to 3 US dollar cents more than eggs from abroad. Higher margins mean higher growth rates – and Oasis Agro along with its new parent stock are ready to facilitate this growth.

Pavel Bogatkin



Mid-size egg producer in Thailand

CHAUYNARONG



L. to R., Brother and sister management team Mr. Pong Chauynarong, General Manager and Dr. Navaporn

To defend its market share amid a price war, Chauynarong farm is taking the high road rather than trying to undercut its competitors. Dr. Navaporn Chauynarong, feed mill manager, says Chauynarong Farm will establish more rigorous quality control to improve all around quality, especially freshness and egg shell durability. It plans to compare the freshness of its eggs to those of competitors and look for solutions to prolong shelf life.

“Customers expect exemplary quality and we are striving for it. Our marketing and technical people visit customers regularly to find out what they are expecting from us. Most customers say that good, uniform egg shell colour and quality is their most appealing feature”, she adds. “For small and medium-sized producers, the superior quality that large producers cannot deliver is the key for sustainable business.”

The farm’s quality control team uses an egg tester to measure aspects of egg quality such as egg weight, eggshell strength, yolk colour, albumen height and Haugh Units. Egg samples are regularly collected to analyze potential problems and breakout testing is done every Wednesday to check internal and external egg quality. “We try to determine whether a dent in the eggshell is due to poor eggshell quality or a mishandling issue. Eggshell and internal egg quality helps us to investigate how well our stockmen do their job and how good our feed

is”, says Dr. Navaporn. Keeping dented and cracked eggs below 3% is the goal for 2015. A colour fan for egg shell colour is being developed as a tool to improve colour uniformity and make the eggs more attractive.

Layer performance

General manager Pong Chauynarong said that the farm has continued to refine its operation. Fixing inefficiencies is the main focus rather than expanding to achieve greater economies of scale.

Flocks are reared in evaporative cooled housing with cage space of 420 square cm, and feeding space of 7 to 10 cm per bird. Crumbled starter feed from a third party vendor is used in the first six weeks followed by mash feed produced internally for the grower, developer, pre-lay, breeder and post-peak breeder periods when the laying rate is below 80%. Feed formulation is based on breeder recommendations and the formulation takes into consideration daily intake.

The current market is willing to pay more for heavier eggs, but in the past, egg weight differences were largely ignored.

Farm and feed operation

The layer breeder, feed mill and layer farm are all located in Krabinburi Province and operated in different compartments within a 48 hectare compound surrounded by teak and fruit trees. The trees keep the air cool and block strong winds, but the areas near the layer and breeder houses and the hatchery are cleared to discourage rodents. The farm has its own research unit where feed additives are tested before they are included in the formula. Besides performance, technical support and after sales service are considered important elements in any procurement decision.

The company has a mill producing mash feed. Feed is prepared and used within one to two days. The mill has corn silos with 3,000 tons of storage capacity. Pigment is not included in

FARM targets top quality

the mainly corn-soy formula. Corn constitutes 48 to 60% of the formula depending on market prices. Yolk colour score ranges from 8 to 9 on the DSM Yolk Colour Fan. Soy-bean meal comes from both South America and local sources. Raw materials are regularly tested for excessive mycotoxin contamination. For example, the maximum limit for fumonisin is 30 ppm, and aflatoxin must never exceed 20 ppb. Phytase enzymes are used to improve nutrient utilization. NSP enzymes are applied when using complex substrates such as DDGS. Meat and bone meal is sourced from reliable suppliers with a good track record to prevent salmonella from entering the food chain.

Breeder operation

The breeder farm was established in 2010. H&N's Brown Nick is a breed that is prominently featured. At full capacity, the hatchery produces over 15,000 day-old layer chicks per week. The chicks are sold at a fixed price regardless of market fluctuations. The chicks are vaccinated for Marek's Disease and customers do their own beak trimming.

The breeders are reared in A-frame cages with a perch for the birds to rest. Surface area is 700 square cm per bird. Each cage contains five males and 45 females. Leak-free nipple drinkers in the breeder house keep litter moisture low to limit ammonia levels.

The new company, called Growup, produces layer chicks to supply internal operations and allied companies. The breeder unit has two houses with 4,000 birds each and a single stage hatchery. The breeder and pullet houses are evaporative cooled. The number of female chicks produced per parent female in 52 weeks varies according to rate of hat-

ching egg utilization but is usually around 90. Mortality between 18 to 75 weeks is below 10%. Breeder chicks are reared on the floor in the first month and then moved to the pullet house (8m x 70m). The pullets are moved to the layer units at 17 weeks. For 2015, plans call for import of 10,000 day old parent stock chicks.

Layer Operation

The layer houses are modified open-sided houses. Each house (16 metres x 105 metres) holds 35,000 birds housed in four tier, A-frame cages. Manure is removed every four to six months and sold as fertilizer.

Marketing

Chuaiyarnong Farm does business with small to medium sized wholesalers. The wholesalers buy eggs in cash and distribute to retailers within a 300 km radius. The furthest markets are Trat in the east and Mahasarakham in Buri Ram province. Eggs are collected and sold the same day. Based on quality control testing, the eggs delivered from the farm have a value of 80 Haugh Units (HU) which is considered AA grade. Minimum order is 21,000 pieces. Most wholesalers pick up eggs every three days.

Over half of the farm's clients have done business with the company for over 10 years. New clients are required to have at least a few years of experience in egg trading and use strong egg containers to minimize cracks and dents. Doing business with a large number of small to medium sized customers is less volatile than depending on only a few large customers. Its research unit is also developing designer eggs, for example, by adding DHA and selenium to serve niche customers. This article appeared in a recent edition of

'Feed & Livestock' magazine of Thailand. It is reprinted here with the kind permission of Editor in Chief and Publisher Mr. Apisit Buranakanonda.

Rich Wall



Entrance to the farm



Interior view of the hatchery.



Inside one of the layer houses.



Egg Quality Control Laboratory



H&N Hatchery Course praised for practical nature



'Hatchery course is great help to us'

Participants of the 10. H&N Hatchery Course, held in Cuxhaven in June this year, praise the practical nature of the course. "I can put the newly obtained information to use right away."

The hatchery course, which started on Sunday June 7th of this year, took its participants through a range of topics within the hatchery segment for five days. "In contrast to the renowned H&N Schools, in which we cover a number of general topics, in the hatchery course we fully focus on various important subject areas relevant to the hatchery industry", describes Dr. Hans-Heinrich Thiele, responsible for the hatchery course and H&N Schools. "Topics such as male management, egg storage, eggshell quality and ventilation are dealt with. "How do we define the most essential subjects? I call it experience", says Thiele. "We are aware of the issues in play and know

what problems our customers are facing. As H&N we always do our utmost to meet these needs in our course programme." H&N is rather successful in this respect, as is confirmed by the positive reactions of the participants. "The different aspects of the hatchery process that are discussed during the hatchery course are very helpful for our industry", says one of the participants, Dr. Rebanta Kumar Bhattarai of the Nepalese HyLay Breeders. "The information is very practical and a great help to us. When I return to Nepal, I will be able to put it to use in my own business right away." He adds: "We want to extend our business and look for ways to fulfill the demands of

our customers. In this hatchery course we have learned that we need to upgrade our system in order to get maximum results of our chicks, parent stock or eggs."

This is the 10th year H&N organises a hatchery course. "Hatcheries are the main earning model of most of H&N's customers. By sharing our experience and knowledge with our customers, we enable them to do a better job and earn more money." However, the hatchery course is not confined to lectures alone. In addition to the lectures the group of participants found inspiration during visits to parent stock hatchery Dorum and Agromix Hatchery.



**Dr. Rebanta Kumar Bhattarai,
HyLay Breeder – Nepal**

“Some hatchery farmers send their employees to courses like this, but I insist on going myself. I own a hatchery but I am a technical person as well. Hearing the information myself enables me to guide my employees. But it goes beyond that. This is my third H&N course. I attended other courses in 2011 and 2012. The contact with Dr. Thiele has been a great help even after the course had ended. If I have a problem, I can always send him some data by email. He has solved several problems this way. So you see, in several ways the hatchery course has been a great help to our company.”

**Mrs. Mafalda Lopes,
H&N Peninsular – Portugal**

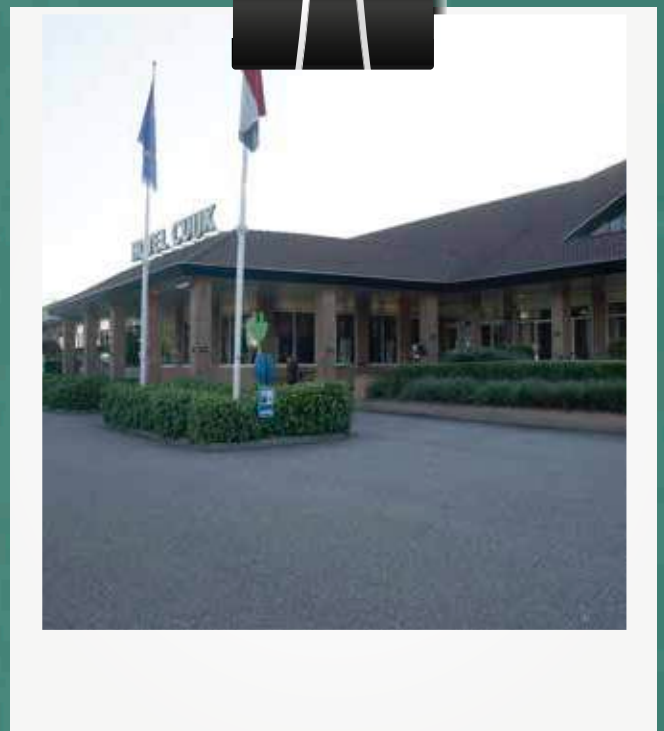
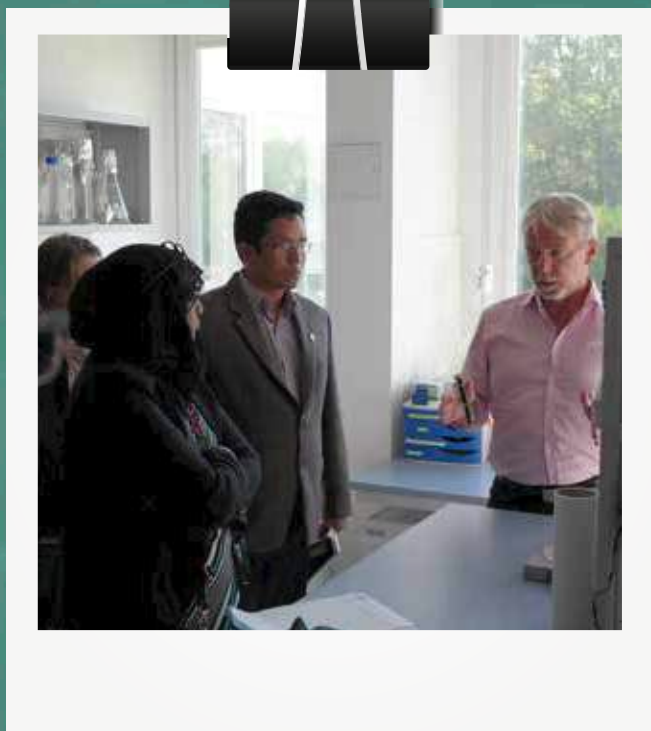
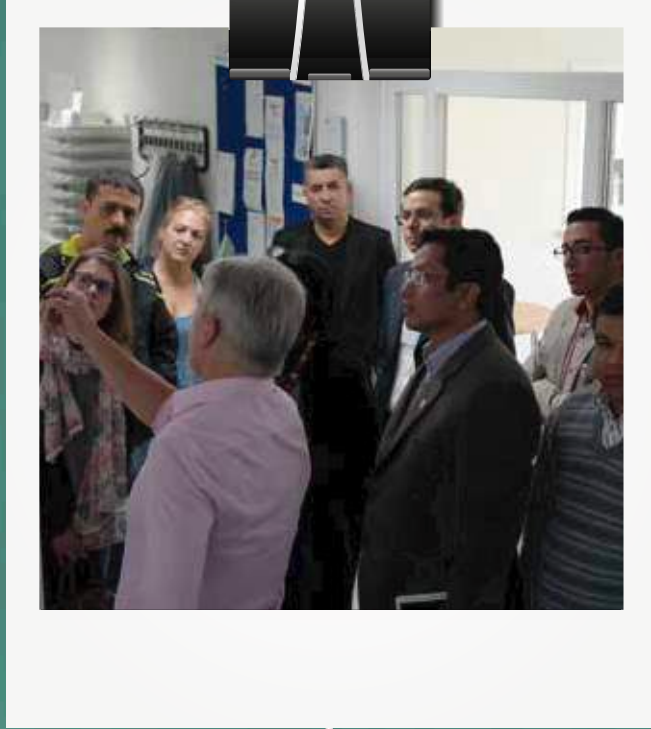
“Right on the first day of the course I was taking notes, writing down numerous things I want to apply in my work. All presentations are very nice and well documented and the experience of the presenters and writers is very welcome. It is wonderful to know what is happening in other places. Which topic had my particular interest? Difficult to say. Every topic on the course list is very interesting to me.”

**Dr. Maha Fathi Mustafa Hamad –
Sudan**

“I enjoyed the course very much. Both the course and the group are very nice. The level of the course is excellent yet easy to understand. There is plenty of opportunity to ask questions and I received a very good answer to every question I asked. I learned a lot about hatchery, including techniques we don't use in Sudan. As soon as I return to my company, I will tell them about these techniques right away. Other topics that stood out for me are male management and hatchery hygiene. It is a very nice course.”

Marleen Teuling







'VIV TURKEY'

The 7th international trade fair for poultry technologies 'VIV TURKEY', known as the leading one of its kind in the region, took place in Istanbul from 11th until 13th of June 2015. The exhibition aims to facilitate the transfer of knowledge and technology between Turkish Poultry sector professionals by creating an international network platform that will foster development for all parties. A range of well-known international and domestic companies from different poultry sectors such as animal health, hygiene, breeding and equipment participated in the exhibition. Among others Oz Tavuk A.S. from city of Yenisehir was one of the main exhibitors in the show. With more than 25 years of partnership with H&N International Oz Tavuk is considered to be one of the main suppliers of the layers day-old-chickens to the Turkish market. For instance total of 14 million of H&N layer chicks were sold by OZ Tavuk in year 2014. Oz Tavuk sets a great value upon its relationship with its customers and customers support. In this context Oz Tavuk's booth was one of the most visited ones during the 3 days of the exhibition this year. They were pleased to welcome a large number of their valued customers and potential business partners. H&N International compliments Oz Tavuk on constant successful attendance in the exhibition.

Farhad Mozafar



*The key
to your profit!*

PROMISING REGION

successful meeting

2nd–18th November 2014, Meeting in Garibaldi, State of Rio Grande del Sul, Brazil.

This poultry area has potential in its current development. At the meeting a number of important egg producers were present. Special attention was paid to our presentation: "Factors of Success" Exchange of experiences with Super Nick.

After the presentation we jointly enjoyed a dinner and planned our future activities in this very important and promising region.

Dr. Ronald Trenchi



*From right to left:
Dr. Mario Nihei
Director de H&N
Avicultura;
Dr. Carmine;
Dr. Agostino –
Sales Represent-
ative for the
Region of H&N
Avicultura;
Dr. Ronald
Trenchi – H&N
International.*



H&N launches two new apps!

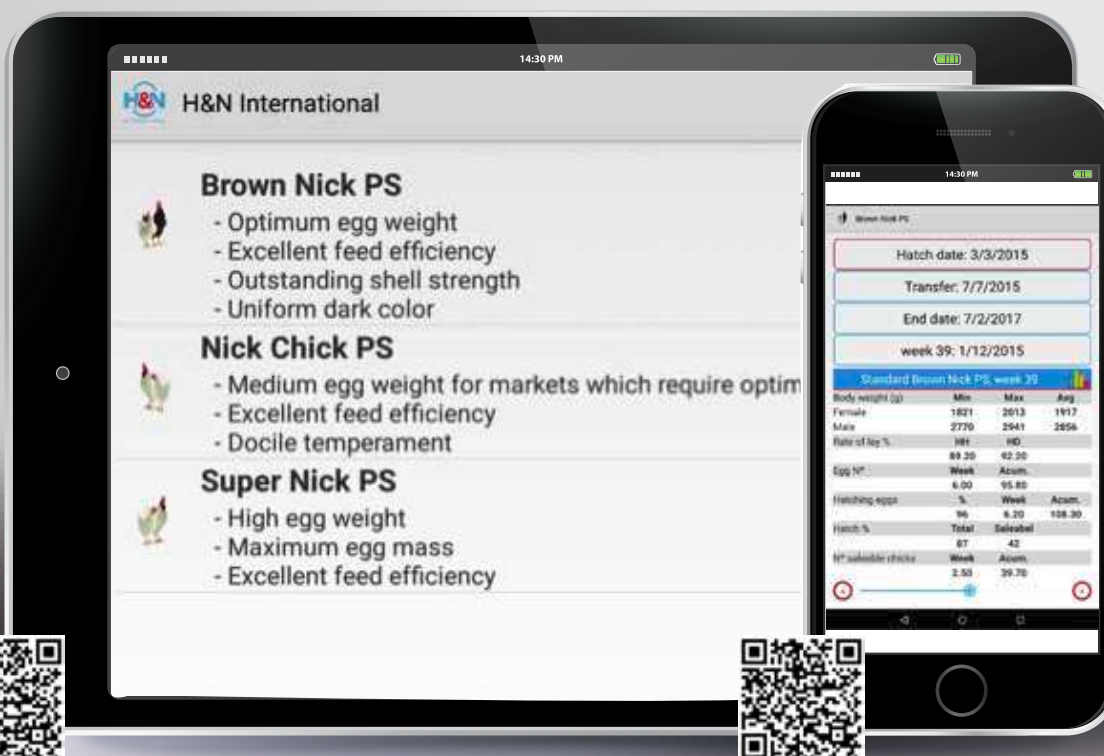
You are a fan of your smartphone or your tablet – then two new apps are now available for you!

H&N International Application Software Today, the so-called 'app' or application software is inextricably connected to the lives of millions of people worldwide using smartphones, tablets and other mobile devices. Also in modern livestock, farming apps are becoming increasingly popular, as tools supporting farmers in daily management are developed. In this context H&N International has started to develop application software based on the specifications and management of its birds. At the moment, two apps are available for iOS and Android devices.

Specifications app

Body weight development in the rearing, production per hen per day, egg weight, livability or the cumulative egg mass are some of the most important parameters for an egg producer to optimize the performance results. For the parent stock farmers, detailed information on performance, numbers of hatching eggs and especially saleable chickens at different ages could also be

some of the main parameters to keep eye on. 'H&N performance specifications app' offers a unique opportunity to compare your results with standards of H&N International commercial layers and parent stock including details and charts. "This app is now available for Android and iOS devices on Google Play Store and Apple App Store."





Lighting Program App

Sexual maturity and performance of layers are substantially affected by the length of daylight during rearing and production. In systems where pullets are kept in windowless houses without outdoor access, lighting programs can be designed to guarantee optimal rearing and preparation for the laying period. However, in many countries worldwide light-tight houses are still rare and environmental controlled houses which have been constructed during the last years are often not fully light-tight. "Lighting programs adapted to specific conditions are a valuable tool in the management of highly productive laying hens. For example, it is

very important to apply the appropriate lighting programs for the laying hens kept in new alternative systems such as free-range. For these kinds of housings a tailor-made lighting program has to be compiled."

'H&N Lighting Program App' offers the opportunity to make this possible set to the season, geographical location and the date of the hatch. This app is now available for iPad tablets and can be downloaded from Apple App Store.

Farhad Mozafar

The importance of quality nutrition and management on the breeder farm

The quality of the day-old chicks is crucial for the success of a layer hatchery. Different approaches to judge chick quality have been proposed in literature and implemented in practise. Today there is no universal procedure available to judge chick quality and the assessments are often difficult to quantify, to interpret and to compare.

There are different chick quality criteria which can be measured in the hatchery: for example chick weight, chick length, chick yield, residual yolk weight, visual parameter like chick activity, navel quality, general appearance, belly size, and in the rearing farm: chick weight at housing, chick weight after the first week and first week mortality.

Chick weight and mortality

While some of these criteria are more meaningful in terms of controlling procedures within the hatchery, like for example chick yield, others are very important for the day-old chick customers. A regular point for discussion here is the first week mortality and also sometimes chick weight. To what extent do the breeders play a role here? Let us start with the easier one: chick weight. If the incubation process is done properly, the chick weight will be two thirds of the original egg weight. Thus, chick weight is relatively predictable for the hatchery when eggs from known source flocks are used, as breeder ma-

agement and nutrition does influence the hatching egg weight.

Flock age

So what hatching egg weight should be targeted in order to improve chick quality? The answer is: it depends. It depends on the breeder flock age. The critical period is the start of production until approximately 30 weeks of age. The higher the egg weight during this period, the earlier the eggs can be used as hatching eggs and the higher the resulting chick weight will be. This is an advantage at this point. Smaller chicks from young breeder flocks are not expected to perform less well as a laying hen. However, they require special attention during transport and brooding. In simple terms, heavier chicks make life easier. In order to achieve a good early egg weight, the body weight development during rearing and the timing of sexual maturity are crucial. It is important to avoid underweight compared to the breed standard – especially during the first 5-6 weeks.



Egg weight

Stocking density, house temperature and the lighting program are important management tools to achieve this goal. The latter should be also used to delay sexual maturity in order to support a high egg weight at onset of lay. After 30 weeks of age the feed formulation and feeding management should be used to limit the further increase of the hatching egg weight. Usually eggs of more than 60 grams will show reduced hatchability while giving no real benefit – for example no benefit regarding first week mortality. First week mortality is often addressed when talking with farmers about chick quality. Many times the hatchery looks like the cause when the mortality exceeds the accepted level. However, there are many different other factors to consider, starting with the brooding and transport conditions, followed by the hatching egg quality. According to

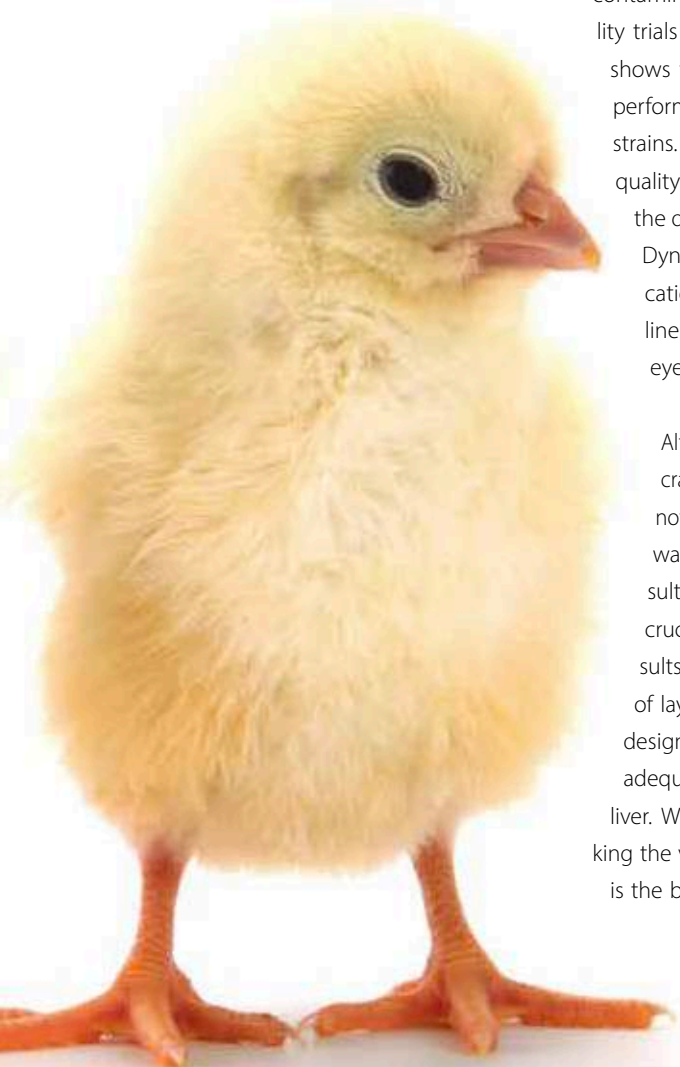


Table 1. Early + mid embryo mortality (%), egg weight loss during incubation (%) and hatch of viable embryos (%) of cracked and normal eggs of two brown egg layer strains. The differences between normal and cracked eggs were significant ($P < 0.001$) for the three presented traits in both lines. The procedures GENMOD (for embryo mortality and hatch of viable) and GLM (for egg weight loss) were used for the analysis (SAS 9.3).

	Line 1		Line 2	
	Normal	Cracked	Normal	Cracked
Embryo mortality (< day 18) (%)	6.0	12.5	7.5	32
Hatch of viable (%)	77.7	57.0	85.1	63.2
Egg weight loss until day 15 (%)	8.8	10.8	9.8	12.7

practical experience, the quality of the eggshell plays an important role here.

Cracked eggs

Once the eggshell has deteriorated due to flock age, problems can occur if the egg handling procedures are causing a higher number of cracked eggs. In practise this is often associated with a higher percentage of contaminated eggs. As meaningful mortality trials are difficult to conduct, Table 1 shows the results of a hatchability test performed with two Brown egg laying strains. Before egg setting, different egg quality traits were measured including the dynamic stiffness of the egg shell. Dynamic stiffness allows the identification of eggs with very small hair-line cracks, which are not visible by eye.

Although the egg weight loss of the cracked eggs during incubation was not excessively high, the hatchability was clearly reduced. The test results suggest that eggshell quality is crucial for optimum incubation results. The management and feeding of layer breeders should therefore be designed to support shell quality by an adequate calcium supply and a healthy liver. While the liver is involved in making the vitamin D3 available, the calcium is the basic component of the eggshell.

It needs to be provided in

large quantities during eggshell formation, which mainly takes place during the night.

Limestone

If just fine limestone is used in feed, there is no calcium available from the gastrointestinal tract during this time, as the fine limestone dissolves quite quickly. In this case the hen needs to take the calcium from the medullary bone. As the efficiency of this process declines with age, it supports eggshell quality as well as bird health when two thirds of the daily calcium supply is provided by coarse limestone. If technically feasible the coarse limestone is ideally fed during the afternoon hours to match the requirements of the chicken later on.

Robert Schulte-Drüggelte

Inbreeding and heterosis in modern breeding of laying hens

The continuous improvement of plants and animals by selective breeding involves two steps: the estimation of breeding values for all candidates of selection, followed by mating plans for the selected parents. Special computer software is used to estimate the breeding values as accurately as possible. The software combines individual and family information from several generations and different test environments.

Commercial laying hens are generally crosses of unrelated breeds or lines, selected for outstanding combining ability. Egg producers don't have to worry about negative effects of inbreeding in commercials. However, inbreeding remains an issue for primary breeders, because intensive selection within 'pure-lines' is inevitably connected with some inbreeding and loss of genetic variation.

Inbreeding

Corn breeders have used inbreeding successfully to develop superior inbred-hybrids. Meanwhile poultry breeders were discouraged by inbreeding depression and increased rates of defects due to recessive alleles. Outcrossing was therefore used in small populations when productivity suffered from inbreeding. Today's primary breeders focus on the preservation of genetic variation. Large populations are kept to minimize the rate of inbreeding.

The opposite of inbreeding depression is 'heterosis'. This is an expression proposed by Shull (1914) to account for the extra vigor due to the union of dissimilar gametes. "Geneticists routinely analyze the genetic variance of and co-variances among traits of economic interest", knows Prof. Flock of H&N. "The genetic parameters may differ between

lines and change over a period of years. Estimates from current generations are combined with economic weights. This is done to construct selection indexes as a basis of balanced and continuous improvements."

Cumulative inbreeding in commercial lines

Inbreeding is a function of population size and intensity of selection. The actual rate of inbreeding can be estimated from pedigree records or approximated with functions proposed in the literature. Ameli (1989) analysed 24 generations of pedigree records of two commercial White Leghorn lines. Ameli compared the rate of inbreeding with reciprocal recurrent selection (RRS) vs. RRS combined with pure-line testing and selection on the basis of both cross-line and pure-line performance (mRRS).

During 23 generations, cumulative inbreeding in two lines (A and B) increased by 11.9 % and 10.8 % according to pedigree records and by 12.6 % and 12.0 % according to a formula proposed by HILL (1979). "This formula takes population size and the variance in family size into consideration", says Prof. Flock. "Across both lines and methods of calculation, the average rate of inbreeding was slightly over 0.5 % per year, with apparently little effect of the breeding system."

Estimating the effects of inbreeding and heterosis in commercial lines

In order to estimate effects of inbreeding on traits of economic interest, 96 selected sires of lines A and B were each mated to 1 full-sister, 1 half-sister and 4 non-related hens of the same line and 4 hens of the opposite line. The progeny of the 8 mating types were reared and tested under identical conditions in single cage from 21 to 44 weeks of age. The results are summarised in the following table 1:

The difference between cross-breds (AB, BA) and non-inbred pure-lines (AA-ur, BB-ur) is a measure of heterosis. Inbreeding effects can be estimated from differences between pure-line daughters of unrelated parents (ur) and full-sib matings (fs) or twice the difference between daughters from half-sib matings (hs) and either progeny from full-sib matings or unrelated parents. In the last two lines of the table, the effects are expressed in percentage loss due to 25% inbreeding or gain due to crossbreeding (heterosis).

Mating plan

Half the heterosis is lost in the next generation. In other words: if the single crosses were used as breeders, their progeny performed half-way between the F1 and the

Table 1: Average performance of cross-line and pure-line daughters of 96 selected sires of two WL lines with different inbreeding (F) and estimated effects of 25% inbreeding and heterosis (in %); part records to 44 wks of age, 1986/87*

Mating	F %	No. hens	Livability %	Egg No.	Egg Mass g/d	Egg Wt. g/egg	Shell Str. kp	Body Wt. g
AxB	0	2310	98.9	149.9	54.0	60.6	3.73	1923
BxA	0	2372	99.6	152.7	53.8	59.0	3.79	1890
AA-ur	13	2424	97.4	138.9	48.3	58.2	3.68	1974
AA-hs	23	583	96.8	134.0	46.7	58.2	3.59	1973
AA-fs	34	485	95.9	129.9	44.4	57.2	3.60	1889
BB-ur	11	2364	98.3	145.1	50.1	57.5	3.49	1638
BB-hs	22	579	99.0	143.9	49.3	57.0	3.45	1634
BB-fs	33	491	98.4	138.5	47.0	56.5	3.38	1606
Effects of								
Inbreeding			-0.72	-6.70	-8.12	-1.90	-3.48	-3.30
Heterosis			+1.43	+6.55	+9.60	+3.28	+5.02	+5.55

* FLOCK, AMELI and GLODEK (1991): Inbreeding and heterosis effects on quantitative traits in a White Leghorn population under long-term RRS. *Brit. Poultry Sci.* 32, 451 – 462.

pure-lines. Similarly, the back-crosses exhibit only half the superiority of the F1 over the parent average. To test the theoretical expectation, we designed a mating plan which included all (4) possible F2 crosses and all (8) possible back-crosses. The results of this test were presented by FLOCK (1980) and are reproduced in table 2.

The estimates of heterosis in tables 1 and 2 are similar for the highly or moderately heritable traits body weight, egg weight

and shell strength, but significantly lower in the recent data (table 1) for livability, egg number and total egg mass per hen housed. The apparent loss of heterosis in these lines is due to two effects: (1) the modification of reciprocal recurrent selection (RRS) to include pure-line records in selection; and (2) the 'ceiling' of one egg per day around peak production.

Apparently pure-line egg production improved faster since the change to mRRS, without losing competitiveness of the

cross-lines. Around 1973/74, peak production of pure-line flocks (grandparents) seldom reached 85%; the single crosses exceeded the pure-lines by about 10% in peak rate of lay. Flock: "Today, the pure-lines and cross-lines are much closer at peak production, and they may peak between 95 and 98%. The heterosis for egg production is expressed mainly in better persistency of egg production and shell quality and cannot be fully expressed in part-year records like in table 1."

Table 2: Averages per mating type and estimates of heterosis; full-year records to 72 weeks of age, collected in 1973/74*

Mating Type	Livability %	Egg No. HH	Egg Mass kg/ HH	Egg Wt. g/egg	Shell Str. kp	Body Wt. g
F1 (2 crosses)	91.8	292	17.67	60.5	38.7	1.65
F2 (4 crosses)	89.2	271	15.91	58.8	37.6	1.61
BC (8 crosses)	89.6	271	15.87	58.6	37.4	1.59
PL (2 purelines)	88.6	249	14.52	58.4	36.4	1.58
Heterosis, abs.						
F1-PL	+3.2	+43	+3.15	+2.1	+2.3	+0.07
2(2F1-F2-BC)	+4.8	+42	+3.56	+3.6	+2.4	+0.10
Average % Het.	+4.5	+17.1	+23.1	+4.9	+6.5	+5.4

*FLOCK (2000): Heterosisverlust durch Reinzucht nach langjähriger RRS. *Zkd* 72, 153-158.



Crude fibre in diets for layers – how to realize?

Layers in rearing and production phase highly benefit from crude fibre in the feed. This message/knowledge has proved for a long time in practice and for some time very well analyzed from a scientific point of view. Science distinguishes between different fractions of fibre - the fraction to be highlighted here is the indigestible fraction - which includes Lignin for instance.

If somebody might have got good experience and some understanding of the topic - crude fibre for layers - the question of how to include crude fibre into layer diets will rise up. First of all it needs to be mentioned that the inclusion of crude fibre into the diets should not reduce the normal nutrient density of the formula - otherwise it might affect the performance data of birds in a negative way. Secondly it highly depends on the availability of suitable raw materials, as there are for instance: barley

and oats as cereals, all kind of bran as by-products from cereals, sunflower and rape seed products, DDGS, Alfalfa and finally lignocellulosis concentrates.

All of these raw materials



Table 1: Nutrient content of selected feedingstuffs (figures at 88% DM)

Feedingstuff	Crude protein %	Crude fibre %	Crude starch %	Energy ME MJ/kg
Wheat	12.1	2.6	58.3	12.78
Rye	9.9	2.4	55.6	12.24
Triticale	12.8	2.5	56.3	12.59
Barley	10.9	5.0	52.7	11.43
Oats	10.6	10.2	39.8	10.25
Maize	9.1	2.3	62.0	13.35
Sorghum (Milo)	10.1	2.1	62.0	13.03
Wheat bran	14.1	11.8	13.1	6.17
Soybean meal 48	46.8	4.3	4.0	9.9
Rapeseed meal	34.0	11.5	5.7	8.7
Fodder peas	22.1	5.9	42.1	11.03
Lignocellulosis concentrates	0	min. 60	0	0

have some lower nutrient concentration in comparison to corn and soya - as most used macro raw materials for poultry feed being used worldwide. In order not to reduce the nutrient density of the diet and as a consequence of the inclusion of the raw materials mentioned above the content of crude fat in diets will normally increase. This mostly requires the possibility to include/dose fat and/or oil into the formula. A in some degree higher content of crude fat in the diets offers a lot of benefits in diets for layers in rearing and production.

The overall level of crude fibre in diets for layers in rearing and production will be determined/calculated via a well established diet optimization - up to 7% has proven to be possible and has not compromised performance data or birds' health - sometimes

health status. Based on this experience we can point out: Crude fibre will never harm your birds! By the way - this knowledge is more and more taken into consideration - even in broiler nutrition.

H&N recommends the use of their knowledge and experience of 'crude fibre in layer diets' - nevertheless we have to realize that most of all layers around the world are fed with so called "corn/soy diets". Corn and soya are available nearly everywhere in the world as basically excellent raw materials in feed formulation for poultry in general. In a lot of countries the raw materials mentioned above - as sources of crude fibre - are not available and we need to feed the birds without using the benefits of crude fibre. This has been possible in the past and will be possible in the future.

So nutritionists need to be aware of what is possible or not possible under a certain circumstance and in an area of the world. For further details please contact the nutritional specialist from H&N International.

Robert Pottgueter





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