



## ADDRESSING HOT WEATHER EFFECT ON SLOWER GROWING CHICKENS

In several countries increased market demand for slower growing chickens has changed the landscape of the broiler industry over the last few years. For these markets, retailers often require standardised carcass and cut-up weights all year round to serve consumers with consistent portion sizes. Within the stipulations of certain concepts, such as maximum average daily gain (ADG) or minimum age, broiler growers need to manage the growth rate and final body weight of their chickens throughout the whole year to be as close as possible to the requirements. This helps to minimise costs and to optimise the predictability of the final weight for the processing plant.

### Slower growing chickens react differently to environmental temperature

Slower growing breeds are selected for excellent robustness with the best-balanced reproduction, growth rates, feed conversion rate (FCR) and meat yield. The selection for bodyweight gain is not a priority and as a result slower growing chickens have less appetite. These chickens adjust their feed intake according to the environmental temperature. When the temperature rises, they first reduce their feed intake and consequently their daily growth to survive. During the cold season, lower indoor temperature or access to free range areas increases their energy requirements for maintenance. They eat more feed to get more energy, thus getting also more protein and faster growth. Flocks grown indoor in well insulated and heated houses are almost not affected.

### How climate change may affect growth speed?

More than just high noon temperatures, it is the combination of hot days ( $> 35^{\circ}\text{C}$ ) and tropical nights ( $> 20^{\circ}\text{C}$ ) which affects growth most. These extreme conditions are expected to be seen more and more around the world. Across Europe, the variation in number of days needed to reach market weight between the hottest and coldest times of the year ranges from less than 1 day in Northern Europe to 7 days in some parts of Southern Europe where conditions can be much more extreme.

### What tools do we have to meet the bodyweight targets?

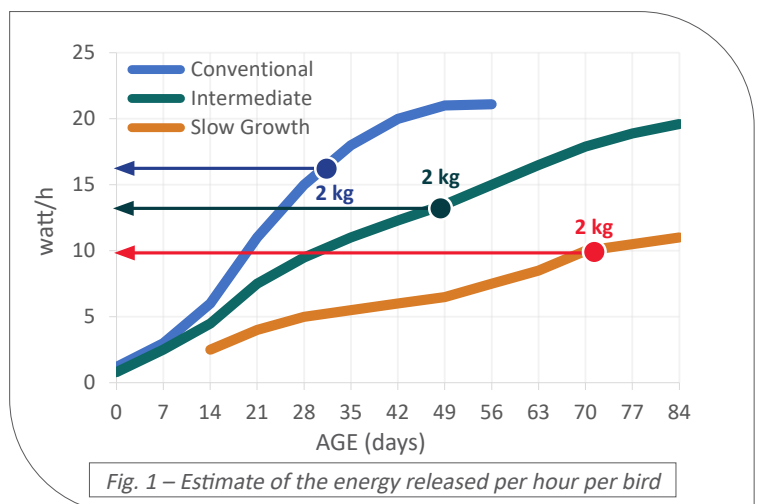
Several techniques can be used with good success to reduce the growth rate during wintertime: feed dilution, mash feed, meal feeding and early natural light. Regular sampling of body weights from the beginning of the growing period is the key for successfully monitoring growth.

Reaching target bodyweights during the warmest months is more difficult. Feeding crumbs or short pellets, replacing some starch by fat, increasing amino-acids levels, and feeding during the night are possible nutritional solutions but are not likely to be sufficient interventions on their own as flocks may reduce their feed intake by up to 15%. Field experience shows that there is also a need to increase the birds' energy losses to encourage them to eat and grow more during summertime.

### How much energy are we talking about to balance the equation and maintain growth?

This is all related to the feed energy intake of which about 70% is released to the environment through sensible and latent heat. A single slow growing chicken would release about 40% less heat and an intermediate growing chicken about 20% less than a conventional broiler at the same bodyweight (see graph), simply because their daily feed intake is much lower.

If we take into consideration the lower stocking density normally used for slower growing concepts, the actual calories released per unit of house surface is 1.5 to 2.5 times less than for conventional broilers.



On the other hand, most of the conventional broilers are processed between 32 and 45 days, when their feathering is just completed, while slower growing chickens normally live between 50 to more than 80 days. Feathering is actually an excellent insulating material. According to Brian Fairchild (University of Georgia), broilers are 3.7 times better insulated per unit of body surface at 45 days versus 25 days. This means that slower growing chickens are wearing a "warm coat" during the last 2 to 6 weeks of their life.



## Which cooling technology for slower growing chickens?

Since the beginning of the 90's, the poultry industry has learned how to cope with the effect of hot weather on performances and has developed technologies relying on evaporative cooling and air speed to minimize bird losses and growth delay.

With slower growing chickens, it is more a matter of heat transfer at bird level than heat dilution at house level; air speed more than air flow because of good feathering but less metabolic weight inside the house. Nevertheless, the effect of air speed alone decreases as temperature rises above 30-32 °C and may become insufficient to remove enough heat energy from the birds to allow them to eat and grow. When the climate dictates that the air must be cooled in addition to providing air speed, the technology used most around the world is evaporative cooling. This often uses cellulose material or plastic pads, but also foggers. It takes 7 times more energy from the environment to evaporate 1 kg of water than to warm it up from 20 to 100°C. The objective is to cool the air, so that air movement removes more convective heat from the birds. Therefore, birds reduce panting and are less affected by high air humidity produced by water evaporation.

The combination between air temperature, humidity and speed has a direct effect on the birds' heat losses and their feed intake.



Fig. 2 – Tunnel ventilation

Tunnel ventilation is the most efficient way to create a uniform high air speed across birds in indoor systems. Other systems do not achieve the same efficiency in hot conditions but are better designed for all-weather conditions. Most of the time, a maximum of 1 to 2 m/s is enough for slow and intermediate growing chickens while 3 m/s or more may be required for conventional heavy broilers.

Increasing air speed means more air flow or a smaller cross-section of the house. In tunnel ventilation systems, seasonal deflectors (see picture) increase average air speed. When heat production at house level is relatively low and the house insulation value is good, the deflectors can be lowered to increase savings in fan capacity and electricity usage. The lower the deflectors and the longer the house, the higher the static pressure build-up along

the house. Anyway, a negative pressure build-up of up to 20-30 Pascals along the house is suitable for most of the fans in the market.

Air mixing can be a good option in free range housing systems or any other system using pop holes, for which the efficient use of negative static pressure ventilation is not an option. It may also be a good solution, associated with large sidewall openings, for indoor systems in locations where the influence of natural wind is permanent due to a combination of climate and topography. Altitude can be a positive factor as it decreases night temperatures.

## Why not using a “cheap low tech” cooling technology?

The University of Arkansas (Yi Liang, Susan E. Watkins, David Mc Creery and Tom Tabler) has been extensively testing a system based on water sprinkling. They stated that it can save up to 70% water when used instead of pad cooling and 40% when used in combination with pad cooling. Litter moisture is similar and air humidity is lower with sprinklers compared to pad cooling. The system is used in practice in the USA for conventional broilers. Pad cooling is still preferred when harsh heat waves occur.

The principle is to distribute, under a water pressure of 2 to 3 kg, 1 mm droplets as evenly as possible on the birds in a 6-8 meters diameter circle around each sprinkler which should be evenly placed 4-5 meters apart to ensure uniform floor coverage. The fine rain is well appreciated by the birds which then tend to stand up and sometimes open their wings. The energy required to evaporate water is taken from the birds themselves instead of the air, so the house condition remains hot and relatively dry.

The sprinkling technology is coming from the greenhouse industry. The On-Off timing is critical to prevent wet litter. At first the cooling stage is 20 seconds “On” and 30 minutes “Off”. During the third and last stage, it is 30 seconds “On” and 5 minutes “Off”. Observation of the litter quality is critical while adapting the On-Off settings to lower stocking densities and slower growing chickens.



Fig. 3 – Example of sprinklers



The thermal pictures below show the cooling effect of sprinklers on birds' feathering.

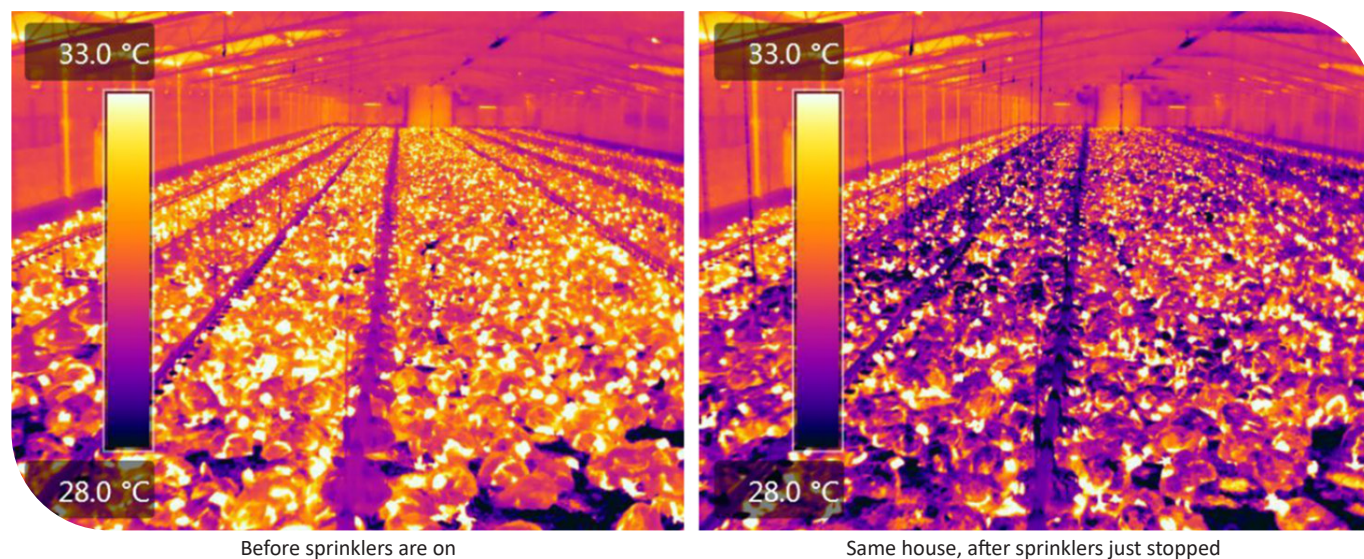


*Fig. 4 – Cooling effect of sprinklers on birds' feathering  
Source: Mark W Dunlop Queensland Government*

The cost of the sprinkling equipment is just a few hundred euros, depending on the automation and the size of the house. It is affordable even for conditions where the risk of being affected by hot weather is quite limited due to the latitude and the low number of production cycles per year. This technology doesn't necessarily require negative pressure ventilation but efficiency is better with high air speed. This is most welcome for free range chickens and any kind of housing system using pop holes.

For free range systems, basics like roof extensions above the pop holes, perpendicular shrubs and willow a few meters away from the house should not be forgotten. It helps attracting birds outside and reduce stocking density inside. It is also an essential part of the image of free-range concepts while it improves the biodiversity of ranging areas.

#### **Taking the best from growing conventional broilers experience adapted to slower growing chickens**

The solutions developed for conventional broilers to reduce the effect of the season on growth and performance are often seen as too expensive for slower growing chickens, especially in regions where the summer season is quite short. Pop holes also make negative pressure ventilation less efficient. The sprinkling system combined with tunnel ventilation or air mixing could be developed and adapted to the specific needs of slower growing chickens to better meet the evolving market developments and support predictability of the final body weights.

Because Mother Nature's effect can't be fully compensated by any technology, it is wise to also delay the catching age as a complementary measure.

References available on request.

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