Frankenstein in the hen house – part one: "Creation of the Monster".

There should be little discussion about ensuring optimal animal welfare outcomes for all farm (and every other kind!) animals, with "free-range" or "pastured" producers seen as the ambassadors and advocates of this imperative. However, few people, whether producers or consumers, realise that the odds are stacked heavily against the achievement of this goal, due to the genetics of the animals they use. Nowhere is this more clearly demonstrated than in the production of "pastured" poultry products in Australia.

When I became involved with poultry nearly 50 years ago, there was little public interest in animal welfare beyond universal condemnation of outright and obvious cruelty. Eggs were produced under the auspices of the state "egg boards", that were established to assist the large number of small producers with marketing their eggs. Egg farms were generally profitable enterprises, with a mixture of semi-intensive (what we would describe as "free range" today) and cage producers in existence in the mid '60's. The laying hens they used were developed by Australian breeding companies and various government departments and were normally a cross between a White Leghorn and either Australorp or New Hampshire. These birds could be relied upon to produce over 250 eggs per year under good management. As time progressed, more and more farms converted or established as cage facilities, and semi-intensive systems gradually disappeared. A similar pattern unfolded across all developed nations of the world.

Fast forward to the '90's, and the vast majority of the worlds laying hens are housed in cages. Deregulation of the egg market, coupled with the growth of the large supermarket chains meant that smaller producers were being forced out of the industry by the large, corporate organisations that operated on a massive scale with narrow margins. In this highly competitive market, the emphasis is always on efficiency, and producers demanded laying birds that could deliver the maximum number of eggs in the shortest period of time with a minimal amount of feed. With these parameters as a major driver, the companies breeding laying birds for distribution around the world focused heavily on achieving these goals and did so with phenomenal success. By the year 2000 laying hens had the genetic potential to lay more than 300 eggs in a year, and this number is closer to 340 or more in 2018. It was during this period that the Australian birds disappeared, and virtually all laying hens in this country originate from a very small number of breeding companies overseas.

With the advent of the internet and the subsequent access to information, consumers became more aware of the various production systems, and the "non-intensive" industry was re-born. People now demanded that their eggs or chicken came from birds that were not housed in cages, but were able to move around freely, preferably with an outdoor range. With this demand came the rapid expansion of the "free-range" and "pastured" sectors, and it is at this point that this disturbing and largely untold horror story begins.

It took nearly 60 years for the international egg industry to reach its current levels of sophistication and efficiency, with incredible advances in nutrition, housing and especially genetics. The billions of

birds housed in cages around the world bear little resemblance to the birds of 60 years ago, a fact that is equally true here in Australia. However, once demand for eggs produced outside cages increased, the birds bred for caged egg production were simply placed in a free-range environment and were expected to perform the same as they would in a cage. This of course was and is completely unrealistic, and as a result problems with feather pecking, cannibalism and poor egg production started to plague free range and pastured egg operations. There has been thousands of hours, millions of dollars and countless papers written by academics researching this phenomenon, yet the situation remains largely unchanged, with the exception of a few superficial solutions employed, such as beak trimming and behavioural distractions or "toys".

What I find completely astounding is the fact that very few of those involved in the industry acknowledge the fact that it has taken over 60 years of intense genetic selection and refinement to produce the modern laying hen, all of which was focused exclusively on the caged egg industry, without any consideration for non-intensive systems. It is only recently that breeding companies have acknowledged the problems facing alternative production systems and are now working on strains better adapted to these systems. So, what does this mean for free range and pastured egg producers in Australia today? In my opinion, it is critical that they understand the raw materials they are working with and develop their production strategies and budgets recognising the various inherent limitations of these modern laying birds.

To begin with, it is essential to understand the sophistication and scale of modern poultry breeding companies. Whether it be for layers or meat birds, the international market for commercial poultry genetic material is controlled by a small number of very large companies. These companies have invested billions of dollars in developing their facilities and employ cutting edge technologies to optimise the performance of their birds. There can be no doubt about the magnitude of their achievements and the changes wrought in the birds they produce. However, it is equally important to acknowledge that with genetic refinement or "selection" there must necessarily be a loss of genetic information. Remember these two important facts: the genome of the domestic chicken is fixed and can only be altered by genetic engineering; and that all domestic poultry are descended from the jungle fowl, a relatively small bird native to south-east Asia. These birds weigh about 1kg, and normally lay around 20 eggs per year. Compare this with the modern-day layer at 340+ eggs per year. To distil all of this information into one simple sentence, please consider the following statement that I quote regularly: **"Modern laying hens are little more than a life-support system for a reproductive tract".**

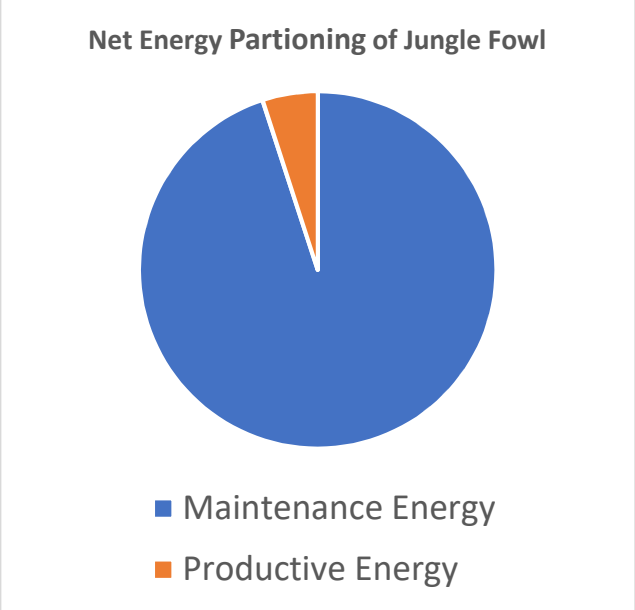
Therefore, all the productive performance that has been achieved with modern commercial poultry has been through the isolation and magnification of specific characteristics, at the expense of an unknown number of genetic characteristics or "traits", potentially including critical physiological, behavioural or metabolic functions such as immune response or nesting behaviour. To illustrate this point, take the example of the single combs of modern layers. The comb of a hen performs a few roles, as a sexual characteristic and a "radiator" for dispelling heat to name two. However, there are many different types of combs in the chicken genome, with the single comb being a "recessive" characteristic. Therefore, the breeding companies had to ensure that they removed all other comb types from their breeding programme to ensure their birds possessed only single combs. This is a

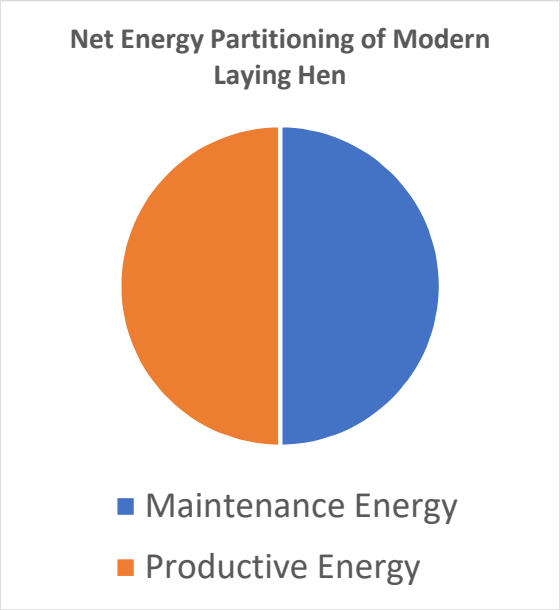
simple and non-critical example and is representative of the process of selection used in livestock breeding practices.

So, how does all of this impact modern day layers, and what are the implications for free range and pastured egg producers? In the second of this three-part series, we will explore how these highly selected strains are affected by “non-cage” production environments, and how this is expressed in the behaviour, performance and physiology of the birds.

Frankenstein in the hen house – part two: “It lives!”.

In part one we looked at the development of the modern egg laying bird; now we’ll focus on how these genetic characteristics are expressed in practical terms. To help explain, please see the two pie charts below (please note – these charts are used to demonstrate a principle, and do not represent precise ratios);





In both charts, the blue section represents the energy (and for the purpose of this exercise we will broaden that term to “nutrients”) required for normal daily functioning (feeding, fighting, breathing, perching, immunity, temperature regulation, feather replacement etc), while the orange section represents the nutrients required for the bird to produce eggs. As the Jungle Fowl only lays a small number of eggs in the course of a year, it partitions very little to egg production throughout most of its productive life. By stark comparison, the modern laying hen must necessarily devote much more of her nutrient resources to the production of eggs, considering that she has the potential to lay an egg nearly every day of the year! Therefore, looking once again at the pie charts, the Jungle Fowl partitions nearly all of it nutrients into maintenance, while the modern laying hen has around half the available nutrients of the Jungle Fowl available for her maintenance functions. When these birds are housed in environmentally controlled sheds, with stable temperatures, precise rations, no predators and virtually no social interaction they can perform to their full genetic potential because

there are few external stressors requiring additional maintenance energy. However, take these birds out of a cage and let them loose on pasture, and the whole picture changes – dramatically! Remember my catch phrase from part one - **"Modern laying hens are little more than a life-support system for a reproductive tract".**

I am confident that every commercial pastured egg producer using a modern "brown" bird (Bond, Hyline, Isa or Lohmann) with a normal beak has experienced some (or maybe all!!) of the following production issues:

- Feather pecking and "silver backing" (see http://www.poultryhub.org/the-phenomenon-of-silver-backing-in-free-range-hens/), resulting in very "bald" birds by 60+ weeks
- Cannibalism, particularly through vent pecking
- Unreliable or variable egg production
- Decreasing egg shell quality with age
- Decreasing eggs shell colour with age
- Low body weights
- Poor persistence (ability to produce a viable quantity of saleable eggs after 60+ weeks)
- Crowding and "anxiousness" of the birds around vehicles and staff when they approach the laying shed
- Inability to achieve and/or maintain a reasonable "peak" of production

Each of these problems are influenced in varying degrees by the genetics of the birds, some slightly and others almost completely. By way of example, let's look more closely at a situation that is so common amongst pastured layer flocks that it is considered normal behaviour, and that is the crowding of the birds around vehicles and staff.

In nearly 20 years of consulting to pastured egg and meat bird producers, the phenomenon of crowding layers is something that really strikes me as a huge problem, yet virtually all producers that I visit are unaware of the dreadful implications of this behaviour. I remember very clearly my first experiences with a client that I have worked with for around 15 years. During my very first visit to the site, we inspected the layer flocks out in the field. As we approached one batch of birds, they all raced toward the vehicle, and as we walked, with all the chooks milling around us, vocalising loudly, my client beamed at me with pride and said "Look, my birds are really pleased to see me". I will never forget the look on this dear man's face as I delivered my response, "They aren't pleased to see you, they're starving!" I thought he was either going to punch me on the nose or burst into tears! I have no doubt that some readers of this article will object to my statement, claiming that the birds have always behaved like this, and that it is a normal behaviour. However, the sad reality is that chickens have a natural aversion or fear of man, and under normal circumstances would prefer to stay out of his or her way. Consider for a moment a flock of young pullets out in the field, say 15 to 16 weeks of age. These birds have not started laying and are settling into their new environment. In most cases these birds show little if any interest in people, although this can vary depending on management practices. However, once these same birds approach peak production, the amount of vocalisation and crowding increases – something I have observed on hundreds of separate occasions on many different locations.

This situation then begs the question “Why ?”; and the answer is as simple as it is disturbing. Before the pullets had started to lay eggs, their demand for nutrients (please refer to the charts at the beginning of part 2) was comparatively low, and they received all they needed from the ration supplied (I am assuming that the ration has been correctly formulated and presented). However, as they approach peak production at least two significant changes take place. First; the reproductive tract increases markedly in size, with the ova (that ultimately form the yolk) growing from barely visible through to full size, and every size in between. The number of growing egg yolks, known as hierarchal ova, depends on many factors, but in most pullets the number of visible ova can be in the hundreds. Once the bird starts laying eggs, there is a constant demand for nutrients to “grow” the egg within the bird. Second; the birds have been ingesting grass during their time on the range, and almost without exception, every single bird in a pastured flock will have some grass or grass fibres present in their gizzard (the grinding organ that acts as the “teeth” of the chicken). The actual amount of grass will vary between individuals, and after opening several thousand gizzards, I have personally seen every extreme, from virtually nil to 100%. Please note that at 100% the bird ultimately dies of starvation, as they are no longer able to digest any food! There are a number of factors driving the ingestion of grass, and these can be reviewed in the following article: http://www.poultryhub.org/the-phenomenon-of-silver-backing-in-free-range-hens/ . So, there are two separate factors conspiring against the birds – an ever-increasing demand for nutrients, and an ever-diminishing capacity to ingest and digest that food. This situation often deteriorates into a savage downward spiral, driven by the birds need for very specific nutrients to produce a “life-capsule” for a developing chick virtually every day of the week.

It is appropriate to pause for a moment and consider the statement underlined above. Every day these birds lay an egg, and that egg is a great source of nourishment for people. But have you ever stopped to consider that the purpose of that egg is not to feed you, but to nourish and protect a chicken from fertilization to hatching? That is 21 days without any external input apart from the warmth of the mother hen (or the incubator). This means that the egg contains a very precise range of nutrients and physical characteristics to complete that important task, and all the inputs for that egg must come to the hen from external sources, particularly through food. Therefore, the modern laying hen, laying an egg nearly every day, is constantly seeking a range of very specific nutrients to meet that need, and this is the cause of most of the behavioural, physiological and metabolic maladies that plague the modern layer more than other types of poultry.

Returning to our crowding hens; it should be clearly understood that chickens have a brilliant ability to identify specific nutrients for their daily needs, sometimes called “dietary intelligence”. The processes by which this takes place are complex, but in simple terms rely on feedback from the bottom end of the digestive tract and other organs to the top end of the bird, namely the eyes and beak. Consider, for example, the amino acid methionine. Methionine is an essential nutrient, meaning it cannot be synthesised by the bird, and must come from external sources. Under normal circumstances a well-balanced ration should meet the needs of a laying hen, and in a caged environment this is generally the case. However, as a result of the dual factors of gizzard impaction and the onset of peak production, a pastured laying hen cannot get all she needs from the prepared ration and seeks other sources of this specific nutrient. In her search for this nutrient she will go to extreme lengths, including crowding around visitors and vehicles, the amount of associated

vocalisation often corresponding to the extent of the nutrient deficit. However, that same search for nutrients can also lead to destructive and costly behaviours, most of which will be familiar to pastured egg producers:

- Feather-pecking. There has been a huge amount of research conducted in an effort to better understand this behaviour, and there are a range of factors that can contribute to its expression. In this particular situation, birds start eating feathers in increasing quantities due to the high level of methionine and other sulphur amino acids they contain. The onset of this behaviour in adult birds can be exacerbated by poor rearing techniques in which the growing birds started feather pecking at an early age. It is important to note that extreme feather pecking has at least two compounding factors to consider – the first is that as the bird increases her consumption of feathers they can "entangle" in the gizzard, creating a very similar situation to gizzard impaction with grass, decreasing the capacity to consume the prepared ration and increasing the desire to eat feathers. The second is the progression from feather pecking to cannibalism, where the birds inadvertently cause their flock mate to bleed by pulling a large quill feather or peck at flesh. Once the "pecker" establishes the value of blood and flesh as a source of methionine, it will actively and aggressively peck its flock mates to meet that dietary need. Sadly, this behaviour is rapidly learned by other birds in the flock, and severe losses from cannibalism can result.

- Vent pecking. Driven by similar circumstances to feather-pecking, vent pecking is commonly associated with poor nesting training, resulting in large numbers of pullets laying their eggs on the ground rather than in the nest boxes provided. Under these circumstances (which are completely avoidable) a bird laying an egg under the shed for example, presents it everted reproductive tract during the act of oviposition (laying an egg) to its surrounding flock mates. Due to the blood red colour of the everted tract, it is not uncommon for another bird to peck aggressively at the exposed flesh, causing bleeding. This is often indicated by eggs with blood streaks being collected. There are a couple of negative outcomes from this behaviour. The first is that the pecked bird may develop an infection of the reproductive tract, which results in a condition known as ascending salpingitis. Birds so affected rarely recover, and normally deteriorate, loosing bodyweight and condition until they die. The second is the pecking birds become aggressive in their behaviour, and actually eat their flock mates from the inside out. I have seen this distressing and costly behaviour on thousands of occasions, and always under pastured, free range conditions, and as noted above, is quickly learned by other birds.

- Gizzard impaction with grass. In my opinion this is the single greatest threat to pastured egg production using modern brown birds, and I have yet to visit a pastured site that was not affected to some degree by gizzard impaction. To date there has been no definitive condition or circumstance acknowledged as the cause, but I have developed a theory supported by a mountain of practical evidence. Most people are not aware that chickens (and other birds) can move digesta (the food passing through the digestive tract) in both directions, forwards towards the cloaca (bottom) and backwards, towards the beak. This very precise capability must serve an important part in effective digestion, and this is where

the largely misunderstood or ignored part of the lower digestive tract, known as the caeca, have a critical role. The caeca are a pair of blind sacs connected to the digestive tract at the end of the small intestine and the commencement of the rectum. A portion of the digestive tract known as the ileocaecal junction controls the flow of digesta into the caeca, preventing even very small solid particles, only allowing liquid to enter. In the caeca a number of functions are performed, including the anaerobic fermentation of the soluble cellulose fraction of the birds' diet. While this specific component is present in a range of feed ingredients, it is prevalent in grass, particularly the fibrous portions of monocotyledon grasses. During the process of fermentation, it is my contention that a range of endogenous (produced within the bird) nutrients or metabolites are created, and these are then moved back up the digestive tract to catalyse, augment or assist in the digestion and absorption of a range of nutrients, including sulphur amino acids like methionine. Given the effectiveness of the birds' "dietary intelligence", it is reasonable to suggest that they soon recognise the relationship between grass and methionine (or a similar nutrient) and consume increasing quantities. It is interesting to note that in my experience birds favour fibrous, long grasses over soft green plants, such as clover. As the birds increase their consumption of grass, the amount of space in the gizzard decreases, increasing the need for more methionine. Ultimately, the bird's gizzard can become completely impacted with grass, and they die of starvation.

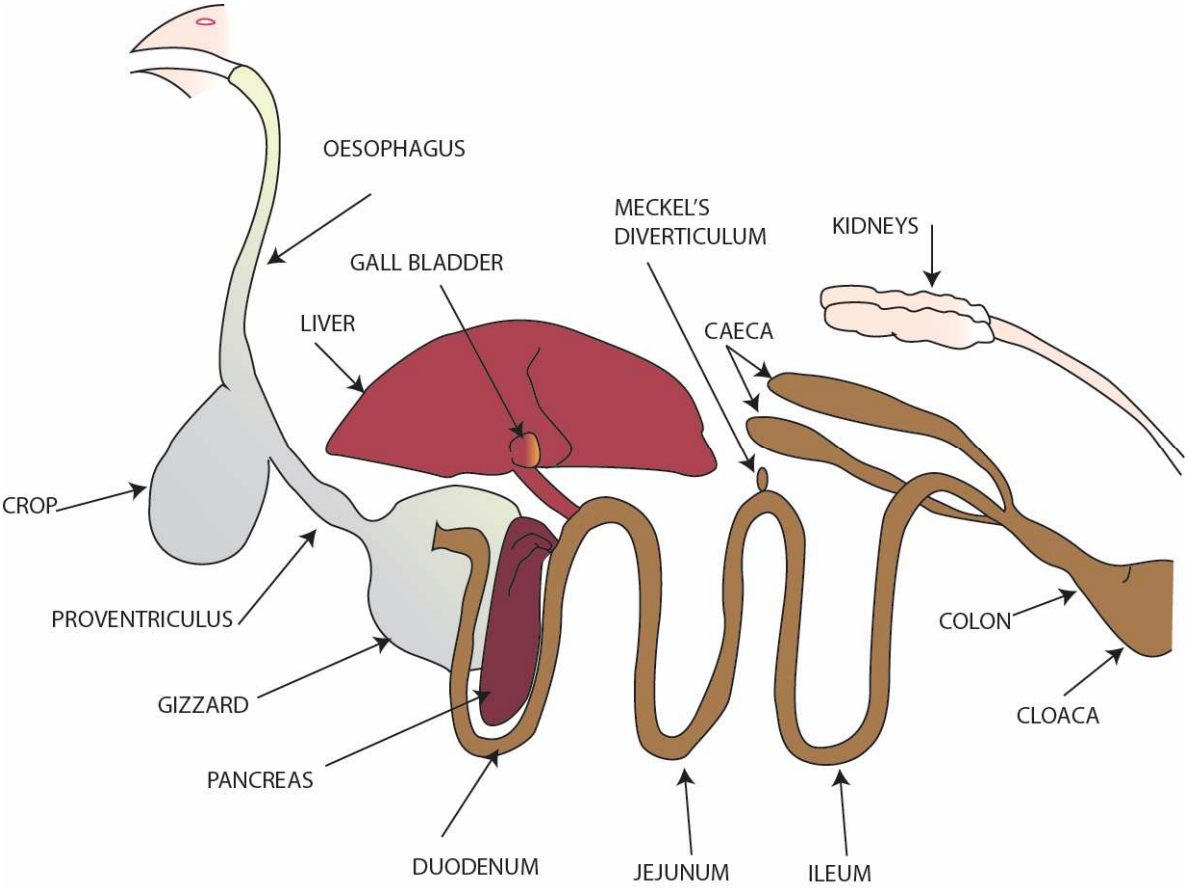


Image courtesy of The Poultry Hub – www.poultryhub.org

Although these observations are disturbing and confronting, they also serve to demonstrate the antagonism that exists between the genetics of the modern layer and the realities of a pastured production environment. In the third and final part of this series, we will investigate strategies to stay in the game and manage these limitations and constraints.

Frankenstein in the hen house – part three: "Living with the monster" or "Square pegs in round holes".

So far in this series of articles we have looked at the origins of the modern brown laying hen, and the consequences of running these birds in commercial, pastured production environments. To conclude this series, we will explore a number of different options and techniques to optimise the welfare outcomes for the modern brown egg layer in a pastured operation, and at the same time assist producers in maintaining and hopefully improving profitability and sustainability.

I chose two separate titles for this third instalment because both are equally true, and both need to be embraced to effectively manage these birds under pastured conditions. "Living with the monster" refers to the fact that these birds have been "created" (bred) for a specific purpose, just like Frankenstein's monster. And just like that monster, there are consequences for letting it out of the lab (or the cage). Producers need to keep this reality at the forefront of their minds as they develop business plans and operating strategies for their farms. "Square pegs in round holes" is an allusion to the fact that running these birds on pasture is an inherently contradictory process and will require the application of compromise and enlightened reason to ensure viability.

It is at this point that I need to advise my readers that I am not about to provide you with a range of silver bullets and magic incantations to overcome this monster. On the contrary, I am about to share a range of skills, knowledge and techniques that require attention to detail and discipline to effectively initiate and maintain. Let's go!!

Start at the beginning – understanding the importance of the baby chick. Very few people involved in this industry have been exposed to the absolutely critical nature of early chick management and its impact on the productive capacity of the laying hen. Do you remember the catch phrase I shared with you earlier - **"Modern laying hens are little more than a life-support system for a reproductive tract"?** For that life support system to operate at peak efficiency, a strong, healthy and well-developed gut must be established to support many of the other physiological and metabolic functions of the bird, and the crucial period for gut development is the first 5 to 7 days of life. The process of achieving the optimal development actually starts with the parent hen that laid the egg from which your laying pullet was hatched. The mother can impact on the chick in a number of ways, including transmitting certain diseases through the egg (known as "vertical transmission"), laying a small egg due to age or nutrition or laying an egg that does not contain a full complement of critical nutrients for the develop of the chick embryo. For this reason, it is very important that your chicks,

whether you rear them yourselves or not, come from a reputable and accountable hatchery. The onus is on the producer to ensure that this is the case for their birds.

Once the baby chicks arrive on site, they require the highest level of care and management to ensure optimal growth. Environment, water and feed must be controlled with absolute precision, particularly during the first 7 – 10 days. Bodyweights of the chicks must be monitored closely to ensure they are growing and developing at an appropriate rate. The birds should be weighed weekly as a minimum throughout their life, and accurate records maintained. If you purchase your pullets from a supplier, you should receive their bodyweight profile chart with the birds. I would be wary of any supplier unable to provide this fundamental management document.

On the subject of accurate and current production data; there have been many times over the years where clients have protested to me that they were operating a simple egg farm, and that all the records and weights they I recommend are simply too complicated for their basic operation. My response has always been this – when you buy a Ferrari (or high-performance laying bird), it requires the very best fuel, expensive tyres and regular, costly services conducted by highly qualified mechanics. The same can be said for these birds; as a high performance "machine" they require very careful and informed management, which includes the very best "fuel". Failure to manage these birds at this level can only lead to sub-standard growth, and diminished productive capacity.

Growing pains - During the rearing period, the birds will normally require vaccination, and this needs to be conducted at the appropriate time following the manufacturers recommendations. If you purchase your pullets at point of lay, your supplier must provide you with a vaccination history document; and if you rear them yourself you must be confident that your vaccination programme is comprehensive and effective. It is important to note that more vaccinations do not necessarily lead to healthier birds, and careful consideration needs to be given to the specific disease risks of your site. During the growing period the frame of the bird is developed, and a range of behaviours are developed and many of these become lifelong habits. A well-known and particularly troublesome example is the habit of roosting or perching. Many started pullets are reared in large sheds where they have no outdoor access. They spend the first 16 weeks of life in these sheds, and never see a perch. When they are delivered to the customer, that customer finds they have an entire batch of birds that don't know how to perch, and often spend their first nights in their new home camped under the shed. There are so many negative repercussions of this situation, including high mortalities due to smothering and a predisposition to laying "ground" or "floor eggs". What I find most frustrating that this is a totally avoidable situation, but little or nothing seems to be done to address the problem.

It is my experience that growing pullets between the ages of 6 and 16 weeks often experience a certain level of neglect, as they no longer require artificial heat to keep them alive, and they are not producing any eggs that require daily collection. For this reason, they receive little attention beyond a daily walk through the sheds to pick up dead birds and ensure the feed and water systems are functional. Many pullet rearing operations use a relatively low specification grower food to save costs on "non-productive" birds. These situations can lead to birds that are "flighty" when they are

delivered to the producer due to their lack of exposure to people; and/or birds that are underweight at delivery – a situation that can lead to many problems as the birds come into production. As mentioned earlier in this section, the operation rearing your pullets should be able to provide you with a complete bodyweight history, from day old to delivery. It is very important that you weigh as many birds as practical at the time of delivery to ensure that you have a reference point for your future records, and to check that the information provided by the pullet grower is accurate.

It is during the growing period that pullets may undergo a "hot-blade" "beak trim", with a range of physical outcomes and repercussions. It is further proof of the "freakish" nature of these types of birds that beak trimming is advocated as "best practice" by the breeding companies, particularly when one considers that the primary purpose for performing this "operation" is to combat feather pecking and cannibalism. There are very clear guidelines for the beak trimming, yet I continue to see birds with too much beak removed, which can lead to an inability or reluctance to eat.

If you are a producer that rears your own pullets from day old, you can ensure that you manage your birds properly during this growing phase by providing appropriate housing and nutrition, coupled with collection of accurate bodyweight data that is plotted against the breeder's standard. Try and spend time with your birds, get them used to the sound of your voice and your movements through the shed. I have found that a radio playing constantly in the brood/rearing shed is a good way of de-sensitising the birds to voices and noises.

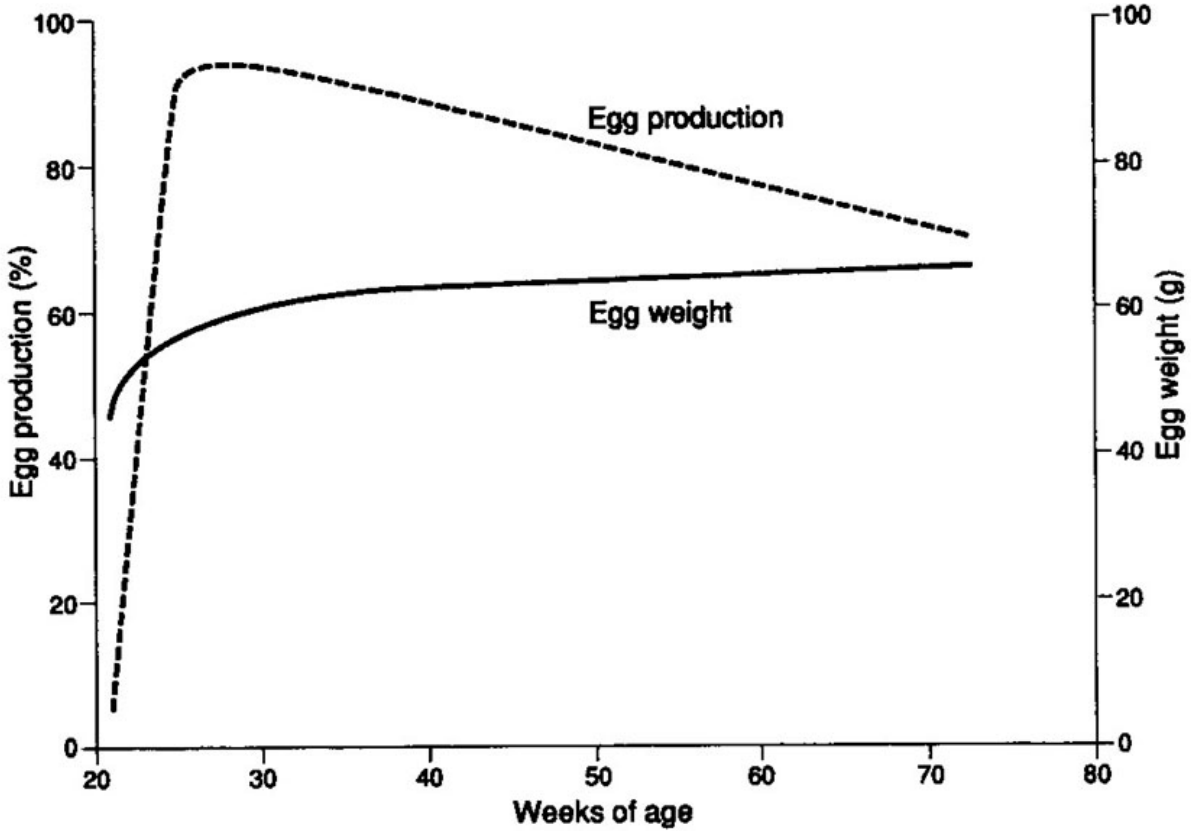
As a last word on rearing pullets, I suggest that all growers and producers familiarise themselves with the various management guides. While these documents contain information that is not necessarily relevant to pastured producers, they do contain a wealth of information, as well as many practical guides and graphs. Please see the links below:

www.hyline.com/userdocs/pages/BRN_ALT_COM_AUS.pdf

www.specialisedbreeders.com.au/wp-content/uploads/2016/04/LTZ-Management-Guide-Alternative-Systems-EN.pdf

https://www.isa-poultry.com/documents/286/Isa_Brown_cs_aviary-barn_product_guide_L8160-2.pdf

Pre-peak: "Peak" production is that time in the birds laying cycle when she has the highest rate of lay, known as hen/day production. With most strains this occurs around 7 weeks after the onset of lay (which should start at 17 weeks) and have the genetic potential to achieve 90+% hen/day production by 24 weeks. I have included a generic "hen day performance graph" below to illustrate these facts, and also demonstrate the way in which egg production diminishes as the bird ages. Please take note of the rapid increase in the rate of lay once production commences and consider for a moment the implications of this phenomenon on the birds' tiny system.



Hen day production graph – courtesy eXtension.org

Earlier in this series I discussed the crowding and vocalising behaviour of brown egg layers, particularly after the onset of egg laying, and we looked at the causes and some outcomes related to this behaviour. It is important to note that this is arguably the most influential period in the bird's productive life, with the exception of the first week of life, and can impact a range of performance issues – sometimes with devastating and costly outcomes. It is important to remember that birds of this pre-peak age are the most valuable birds on the site, not only in terms of the money invested in them to date, but also in terms of their productive potential. Mortalities at this age should be avoided at all reasonable cost.

In terms of management strategies at this age, there are many things a producer can do to prevent or reduce losses of birds and production, with arguably the most important being providing appropriate nutrition that supports the rapid increase in egg production, meets all the additional "maintenance" needs of the bird at this time and provides for an upward trend in bodyweight throughout this period. Once peak production has been achieved, and egg production starts to decline, the ration can be adjusted accordingly. As mentioned earlier, the only effective means to accurately determine body weight profiles is to weigh the birds on a weekly basis. As a rule of thumb, 17-week-old pullets should weigh around 1.7kgs, increasing to around 2.0kg by 24 weeks. Producers should aim for a consistent increase in bodyweight during this period, even if it the increase is a modest 20grams in one week. It is very important to note that while a limited increase in weight every week is desirable, there is a danger of affecting production and the potential for

prolapse if the birds are permitted to put on too much weight, depositing fat in the body cavity around the reproductive tract. I hasten to add, that after nearly 20 years of consultancy, and observing and handling many thousands of pastured birds, I have yet to see pullets at this age put on too much weight. Without exception, the consistent observation is that of pullets that struggle to maintain weight, and generally start to lose weight once production has exceeded 50%.

In concluding this section on pre-peak, I must add that the issues raised above are not the only critical factors that must be addressed at this time. Training for perching and nesting, controlling ground or floor eggs and strategies for photo-stimulation are just some of these critical factors, and require careful and informed consideration, more than I can provide within the constraints of this particular topic.

Post-peak: Once egg production has reached its zenith, there is a normal and natural decline in hen day production, as demonstrated in the graph above. It would be nice to think that things will now be a little easier given the diminishing demand for nutrients, however this may not necessarily be the case. Depending on the way in which the birds were reared, and how well they were managed through peak production; there is the potential for a severe decline in general bird health, egg production and egg quality.

Probably the most common issue with post-peak birds in a rapid decline in egg shell quality and intensity of shell colour (assuming the use of “brown” laying strains). There are a number of factors that can contribute to this situation, including inappropriate nutrition (including water supply), internal parasite burden – (particularly tapeworm, which is a problem for pastured birds because of the indirect lifecycle of the parasite, and the complete lack of an appropriate control measure), and compromised gut integrity. And of these three, I believe that gut integrity is the most significant of all. Harking back to my comments regarding the “life support system”, it must be understood that for any nutrient to be effectively used by the bird, it must pass across a cell wall to enter the system of the bird. If the cell wall is compromised in any way (poor development due to substandard rearing conditions, disease (particularly coccidiosis), internal parasites or deterioration during the peak lay period), then the bird’s ability to draw nourishment from their food is diminished.

Many producers will acknowledge a decline in shell quality with age. Often times a lack of calcium in the diet is suspected, but many operations provide their birds with ad lib calcium (shell or limestone grit), so this is probably not the cause. One definite contributing factor is egg size, as the bird assigns or “partitions” the same amount of calcium for every egg she lays. This means that pullet eggs generally have thick shells, because the calcium has a smaller area to cover. As the egg size increases, the shell thickness must necessarily decrease because no additional calcium is partitioned for the increased size. This normal and anticipated reduction in shell thickness is magnified when gut integrity/health is compromised.

Conclusion: So, how can all of this be applied in a practical and profitable way by the pastured egg producer? The most important thing is to “be aware” and understand what you are dealing with. Acknowledge the apparent conflict between genetics and production environment and take appropriate steps to circumvent issues before they manifest themselves. Gain greater control of pullet rearing/quality and expect the best from your pullet supplier.