Life Cycle Assessment/Analysis

&

Farrowing

Introduction (Recap from Part 1.)

L C A stands for either **L**ife **C**ycle **A**ssessment or **A**nalysis, describing the methodology that supports understanding of the impact associated with every stage of the life cycle of a commercial process, product or service. It involves a thorough index of energy and materials, as a resource within process, product or service; to understand the cumulative potential impact.

3E represents the principle of economic, ethical, and environmental, efficiency and responsibility in livestock production, it is central to 3E Precision Metrics, and the current development of the 3E Husbandry Index.

In part 2, we are looking at the orchestration and role of collaborative technologies, a central ambition of HALE Intelligent Farming.

LCA & Farrowing.

This is the central stage of each production cycle that occurs within the life cycle of the individual breeding female. It is the next date in her production diary, following a successful first service date[1].

[1] *In LCA 3E Precision Husbandry there is an important predicted date that follows the successful service date. It is found in the Service Group Report design, in the opening Report Summary page, in the column headed ' Next Production Cycle Start Date'. This is based on the first service date plus the successful (average) production cycle (index) of the herd gestation + lactation period in days. It is important because it indicates the amount of time available to begin to plan and prepare replacement gilts for when the service group will remove and replace breeding sows that have reached the business herd profile limitation, or along with any parity 1 & 2 gilts, are under-performing.*

Within the operating schedule of the commercial husbandry team, there should be made available, a month before a service group is due in farrowing, a priority listing of the animals and their individual, farrowing dates. This list should be given to the management of farrowing, and a meeting arranged with the management of the females in gestation to view the animals in the listing. The purpose is to agree to any change in the feeding strategy to ensure the animals are delivered to the farrowing team, with a strategic body-condition score, and overall appearance.

The recording of Farrowing data requires a minimum of the date, and the number of pigs born alive, dead (stillbirth), and mummified (optional).

The Date. This is very important in calculating the pregnancy length as a herd average, between the recording of the first service and parturition. If the herd average is outside normal expectation in length, it should stimulate discussion with the pig specialist veterinarian supporting the husbandry team.

The reason being that it could indicate, when there is universal use of artificial insemination (AI), that the insemination protocols need reviewing. For example, if the AI system employed uses a vacuum pack to store, deliver and insinuate the semen at insemination, and the average length of pregnancy is questionable, the cause could be characterized by the husbandry team recording a high incidence of having to squeeze/pressurize the vacuum pack to complete the insemination. This indicates a mis-timing of insemination and will lead to significant waste of resources, and the implication of failure of the 3E principle.

The Number of Pigs Born. This is vital to the measurement of, and the interrelationship between data that reports output. Especially as it represents the flow of pigs at its maximum from the point of birth to the point of sale. Part 1 highlighted some of the impact of the interrelationship. For example, when farrowing rate% is calculated using LCA 3E Precision Metrics the output begins to reduce from the original first record, producing a result that reflects commercial reality. We studied the first production cycle of a LCA cohort in which the original conventional metric result average was 12.47 pigs born alive per litter, this reduced to 11.36 when run through the LCA algorithm. The return on investment of resources (ROIOR) of energy and materials begins to visibly reduce, impacting the long-term value of the business.

This is a good point in the series to introduce the concept, and context of collaborative technologies. We are at the point at which the sow has delivered, contributing to a generation of pigs that at weaning, and already further reduced, will coalesce into batch(es) of feeding pigs that grow on through the 'Pig to Pork' stage of production.

Returning to the point we are at, the gilt/sow has given birth and begun nurturing her litter. In nature the relationship between mother and progeny is uniquely established in a bond to some extent mysterious in every species.

It is a bond we break every single time we wean the litter, locking the depths of mystery away to the detriment of **3E P**recision **H**usbandry, and the **R**eturn **O**n **I**nvestment **O**f **R**esource.

I have written over several years about the single most important piece of technology we have in the digital armoury available to our industry. It is a golden thread that could be woven into the spreading, technological tapestry of the global pig industry. It is the Electronic Identity (EID), or Radio Frequency Identity (RFID) Ear Tag, because it reasonably captures and seals the mysterious, bonded relationship of nature, gifting husbandry teams throughout the global industry opportunity to gain greater understanding through for example, 3E Precision Metrics that support 3E Precision Husbandry I am basing this series on.

The confinement of the breeding female from parturition to weaning in whatever form it is eventually sanctioned is necessarily vital, in the context of animals that are housed in purposely designed systems, if we are to continue to work within the evolution of food production. By digitally linking mother and progeny, we secondarily link them all to the digital systems that manage the process controls of an efficient life that we, as intelligent farmers, comply with through the 3E principles.

An Inconclusive List of Collaborative Technologies.

- EID & RFID Ear-Tags
- Dry Sow & Lactation Feed Control Computer Systems
- Pig Visioning & Farm-based Servers
- Environmental Control
- Artificial Intelligence

At this present time, I can only begin with 'IMAGINE THAT'…pig production husbandry teams could be trained to use very singular technologies with specific purposes, that are designed to collaborate with each other across the borders of proprietary ownership and intellectual property (IP). And, that weaning no longer breaks the connection between the genetic source and, until recently, theoretical genetic potential.

From Farrowing.

It is not unreasonable to consider that what we might discover through joined-up Research & Development, equitably funded (without commercial prejudice), is the key to unlocking theoretical genetic potential, and much more than remains a possible unknown in the relationship between mother and her progeny, and the parity of mother to the performance of each subsequent litter. There is an inevitable interrelationship developing between the relational data produced by the sow and her progeny through the interaction of animals managed by husbandry strategies, and the evolving possibilities of the 'other' AI Artificial Intelligence. This is critical to the future of global pig production.

Today, the almost ubiquitous computer network, to paraphrase Y.N. Harari in his book 'Nexus', "has become the connection of most human activities". If you doubt this, I will ask a simple question "where" (if you possess one) "is your mobile phone as you read this?" This is the prime example of the ubiquitous computer connection. It knows where you are on the planet, it tracks a significant amount of detail of your transactions with the commercial world, the food you order, the media you read, it knows most of your friends.

I believe it is this that influences the skepticism of most of us working in farming, which is understandable. I am confident (even at my age) that we need to investigate the technologies available to industry, especially if we approach the consideration, wholesale. We should expect the various exclusive, narrowly focused technologies, to collaborate in order to present a total package to precision husbandry.

The central ambition of this series is to drive the improvement in efficiency of the sow retention rate in economic, ethical and environmental terms. I believe that once this begins to happen the commercial husbandry teams will discover the possibilities of creating and introducing single parity service group structures to continuous flow production systems, and from this, single parity sourced feeding herd batch/group populations. I have to add at this stage "possibly not in my life cycle" but that's evolution. What can begin with the EID/RFID bonding of linear genetic multiple generations can facilitate the employment of process controls of digital technology options for every stage of the 'Pig to Pork' journey.

This is a journey from Farrowing to sustainable Return on Investment of Resource. And collaborative technologies will support every business that invests in them in this context. They are engineered computer machinery that can gather important information (data) from the interaction with farmed animals, while simultaneously responding to programmed process controls (with certain technologies e.g. feed stations, environmental controls), process the data infinitely quicker than a room full of humans, and increasingly report the predictability of performance. It is important to recognize, (for me certainly) that all of this must remain connected to human input and human response. The support is not complete without the people who work to supply improving genetics, feed formulation and delivery, healthcare and welfare care to both the animals and the husbandry team. I see this as the unique capacity of human consciousness.

What LCA is clearly demonstrating is the need for these technologies, and those who are developing them to connect, with the people for whom they believe they are creating them. It is a joint relationship of discovery. A person with a PhD qualification, that their hard work has achieved, will understand one foundation of the how and why of each new discovery. A person with some comparable years of experience in the art and craft of pig husbandry will have a compatible understanding of the how and why of each new discovery. There are several unique categories of technologies available to industry, and one unique husbandry team on each farm to take delivery, learn and implement them.

My role within the team at HALE Intelligent Farming is a voluntary one, borne of almost two years of friendship formed out of a regular weekly online meeting between me in the UK and Josh, Travis and Paul in the US. However, it has been our privilege and delight to be joined occasionally by others from other parts of the global family with the same commitment to pursue the benefits of collaborative technologies to pig production, and greater responsibility for the contribution of farming to the sustainability of the planet.

Back to Farrowing.

The specific programme that I have referenced for the last 26 years is the former AgroSoft WinPig, now AgroVision PigVision programme. In the Parity Analysis Report in this programme there are two data rows reporting the Standard Deviation (SD) for the born alive per litter and weaned per litter results. This is a valuable window on the litter management of lactation husbandry. SD for born alive will have present the degree of variation of litter size in and compared across the production cycles within the lifecycle of the exclusive LCA cohorts. This must feature in the regular husbandry team discussions between the people responsible for insemination and those responsible for farrowing. This takes us back to the point about the length of pregnancy and the insemination protocols, adding further consideration of the impact of forced insemination and understanding the timing of oestrus, and the waste of resources. A high SD result challenges not only the insemination protocols but also the management protocols of early gestation management, and finally if the AI, and dry sow husbandry staff believe that they are doing a good job, then it comes down to farrowing management to look at the ratio of born alive to stillbirths. The farrowing team alone come under further scrutiny when considering the SD for weaned per litter. Where the genetic potential for reproductive prolificacy is realized in the born alive per litter result, that prolificacy becomes immediately the responsibility of the farrowing husbandry team to continue that genetic realization.

The SD for weaned per litter is a reliable indicator of how much litter size management is happening during the lactation period, this includes levelling up for the number of pigs in the litter, redistribution of compatible piglet size etc.

The principle of greater collaboration applies not just to supporting technologies, but equally to the members of every husbandry team.

Next in this series will be Weaning. By failing to connect piglets to their birth mother by utilizing EID and RFID digital technology we spurn a priceless opportunity to understand the art and craft of pig production in relation to having a greater say as an industry in our future. The great 'unavoidable' disconnection between piglets and their birth mother is weaning. It is because it is a forced disconnection in the interest of commercial reality. Weaning creates the need for which collaborative technologies exist.