Life Cycle Assessment/Analysis

&

Weaned

Introduction.

Weaned is the status of the novice feeding herd pig following the transition at weaning which was the theme of part 3 of this series. It is a challenge to apply life cycle (LCA) 3E Precision Metrics to the feeding herd because the vast percentage of weaned pigs never become digitally attached to their mothers before their physical separation. Some of (this) Part 4 will include hypothetical narrative based on the value proposition of collaborative technologies which were touched on in part 3. However, the future will not wait in this time in which the rate of adoption is falling further behind the rate of development of valuable technologies that make a sustainable future possible.

Weaned.

This experience of an individual weaned pig at weaning is a greater threat to survival than birth. This is because the pig is conscious of the separation from its mother, and for a few, its replacement foster mother as a practical factor of precision husbandry litter management. Stress is a significant consequence of consciousness for a pig as young as 3-weeks, and as old as 5-weeks of age. It is a threat and the threshold of the pathological inducement of disease, behavioural vice, and debilitating inappetence. As a husbandry task it is often stressful for the operational team. Weaning is a routine 'perfect storm', that has to be got through for pigs and people.

Parts 1 to 3 of this series looked at the deeper understanding that LCA 3E Precision Metrics, and 3E Precision Husbandry present to the operation of the breeding herd as the first stage in the production of the pig to pork process. Part 4. 'Weaned', comes under the same focus, as the journey of the feeding herd pig commences. There is an incredible amount of business opportunity in the understanding of 3E Precision Husbandry within the LCA of the feeding herd.

One of the central elements of this is the scientific growth curve that I believe is part of every pig performance recording system for feeding herds. I refer to the scientific feed curve of the PigVision[1] system in part 4, which I have been familiar with for more than 25 years. And how this opens up life cycle analysis to the husbandry teams in pig production. Whatever system individual businesses use, the growth curve, along with the EID and RFID ear tags, positions pig recording at the heart the principle of collaborative technology, a cornerstone of precision farming.

[1] *I first encountered PigVision when it was called WinPig, as the MD of AgroSoft UK, now AgroVision. I am given the gracious permission of AgroVision to access as I continue to work with mutual clients. The scientific growth curve is a vital component of this.*

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A Spectrum of Weaners.

We can have an Armoury of Aardvarks, a Bellowing of Bullfinches, a Clowder of Cats, a Dole of Doves, …a Gaggle of Geese, a Horde of Hamsters, …a Fluther or Smack of Jellyfish, a Loveliness of Ladybirds, a Lounge of Lizards (who'd have thought), …an Eclipse of Moths, and a Prickle of Porcupines …BUT for me is has to be, a Sounder of Hogs within which we find (in my world) a Spectrum of Weaners.

And this is Why.

From 3E Progeny One-Pig, I have constructed a table of results Table 1 and a summary Table 2 (Below).

Table 1 includes four growth curve results which attempt to open up the Growth Curve for the herd Average result from weaning to sale Liveweight.

The herd average result is the third of the four sections of data. This begins with an entry liveweight of 8.00Kg, and a sale liveweight of 121.06Kg. The adjustment is non-scientific, and here I welcome any comment from the scientific community that would help the exercise to be more precise, in the long-term. (There will be more on this is part 5.)

To make an adjustment of the entry liveweight to represent the four calculated sections of 6.00Kg , 7.00Kg, 8.00Kg, and 9.00Kg start weights I simply calculated the percentage daily liveweight gain (DLwtGn) of the herd average liveweight on day of entry. This is a relative figure that applied across the four 3E Progeny One-Pig tables, which also recalculate the feed conversion ratio (FCR), informs Table 1. I acknowledge and accept the complexities which challenge this singular first approach. However, in the absence of much supporting research being directly available, I am confident of the picture tables 1 and 2 present, when I consider the anecdotal evidence I have listened to and experienced personally, over many years. These tables, I suspect, will not be far out, and I believe serve the purpose of part 4.

Complexities.

Each separate growth curve section (relief) in table 1. has a sequence of reported data rows which are based on the liveweight at a point of transition to the next ration formulation in the feeding programme of the whole (average) herd. The spectrum of pigs within the group means that there is an escalating disparity in age and therefore stage of physiological maturity, and nutritional requirements. Take the transition at around 35Kg, the difference in age between the lightest and the heaviest original weaner is 19 days. That is almost 3-weeks; split down the middle some pigs have to change diet 10 days too early and some 10 days too late.

3E Precision Husbandry will need to know the economic implications of such a growing gap. Both groups within the overall population will be slowed down by inappropriate nutrition, there is a lost opportunity cost to this, ethically it could cause digestive stress to the animals, and it could disrupt the protein/nitrogen balance of environmental responsibility. The average sale weight of circa 121Kg means the most efficient pigs will be dispatched 12 days early, but the lighter pigs that don't make the weight in the overall average are very likely to erode this economic benefit, and more. And so on…

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Table 1.

Day	Liveweight (Kg)	DLwtGn (Kg)		Feed / Day (Kg)	Cumulative Feed Intake (Kg)	Age (Days)
1	6.00	0.230	0.230	0.38	0.38	25
15	9.81	0.323	0.323	0.56	6.96	39
26	13.77	0.403	0.403	0.75	14.27	50
65	34.98	0.681	0.681	1.63	60.28	89
134	**90.80**	**0.858**	**0.858**	**3.11**	**228.64**	**158**
1	7.00	0.268	0.268	0.44	0.44	25
11	10.01	0.346	0.346	0.59	5.60	35
21	13.83	0.428	0.428	0.77	12.48	45
57	34.72	0.735	0.735	1.66	55.96	81
118	89.86	1.004	1.004	3.32	210.89	142
134	**105.93**	**1.001**	**1.001**	**3.63**	**266.75**	**158**
1	8.00	0.306	0.306	0.50	0.50	25
7	9.97	0.356	0.356	0.60	3.83	31
17	13.95	0.452	0.452	0.80	10.86	41
51	34.82	0.786	0.786	1.71	53.01	75
107	90.17	1.130	1.130	3.50	200.75	131
124	109.59	1.150	1.150	3.93	264.27	148
134	**121.06**	**1.144**	**1.144**	**4.15**	**304.85**	**158**
1	9.00	0.344	0.344	0.56	0.56	25
4	10.06	0.374	0.374	0.62	2.36	28
13	13.78	0.465	0.465	0.80	8.78	37
46	34.92	0.830	0.830	1.76	50.35	70
98	90.14	1.241	1.241	3.63	191.59	122
113	109.10	1.284	1.284	4.12	250.11	137
122	**120.70**	**1.293**	**1.293**	**4.38**	**288.48**	**146**
134	136.19	1.287	1.287	4.67	342.96	158

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Table 2.

Day	Liveweight (Kg)	End Weight +/- (Kg)	DLwtGn (Kg)	Age (Days)
134	6.00	-30.27	0.858	158
134	7.00	-15.13	1.001	158
134	8.00	Herd Ave.	1.144	158
134	9.00	15.13	1.287	158

We know that some lighter pigs at weaning have already transitioned well and will not be as compromised as others at that weight. Equally the heavier pigs will include some butterball pigs that have gorged only on mother's milk, it is probably their creep transitioned siblings that are amongst the lighter pigs. There will be a degree of leveling up between the two extremes. This is why I suggested earlier that the 'weaned' challenge needs a greater input from scientists.

I wrote (above) that the 'experience of an individual weaned pig at weaning is a greater threat to survival than birth'. 3E Precision Husbandry must consider the level of care required in the first 3-weeks of the weaned pig's continued journey in the feeding herd. The farrowing room is designed to provide the highest levels of access, visibility and environmental control to the husbandry team. It is also designed to confine individual families (of siblings) under minimal threat. The design of a high percentage of 'NURSERY' accommodation is stone-age in comparison. The nursey design is the root of much of what becomes the challenge of the husbandry of the feeding herd. It is the bedrock of induced stress.

Wean & Stress the Antithesis of 3E Precision Husbandry.

In part 3 I discussed the physical separation of the piglet from its mother, and the prospect of maintaining a digital relationship, I will explore the benefits of this in part 5 'Digital Pig'. Herein, I want to focus on physical separation. Stress is the pig's first experience on weaning day, and however hard we try it is the threshold of induced stress.

There are many diagnosed causes of the problems we face in rearing, growing and finishing, some of these will feature in the life of the digital pig. Here are few thoughts I want to share, to some they are probably as easy to dismiss as much as the technology available to support pig production today. I share them from a mixture of practical experiences and a passion to understand.

Tail & Flank Biting can be the result of pigs compromised by a combination of social, physiological, and environmental stress through a lack of the appropriate, and immediate husbandry response to the weaned pig. Tail-biting can be a delayed reflex in a continuously threatening environment.

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The growth curve study in table 1 is also the picture of the litter at weaning, a spectrum profile of variety in the litter siblings. What we still don't understand about the relationship between weight at weaning of the individual pig and its future feed efficiency should be enough to make us question splitting litters up at weaning in order to create 'even' groups in the nursery. These groups can become an optical illusion within a month. Group the whole litters together at weaning and give them a simultaneous choice of the first and second rations in the feed plan or employ a transition feeder, keeping the feed fresh to the point of ration feeding. Provide bite, and trough water supply access. Don't worry about what the pigs look like, the nursery is not a shop window, it's a critical care stage. Select 'even' groups after at least one month. Always restrict feed for a few hours before re-mixing pigs and make sure they all have access to feed (floor feed extra if you have to). Fill them up, it will take the edge of the unfamiliarity that starts most fights amongst new neighbours. After a feed, and a sleep they are more amenable.

Now, I have just looked at some data coming in from outdoor pig production. In the UK 40%+ of the breeding herd is farmed outdoors, and some of the progeny is reared outdoor to. We have just had a few days of sunshine, and a spike in mortality to a single cause of, HEAT.

In part 3, I wrote that 'in part 4. I will move from Weaning to Weaned. I will also be attempting to persuade producers to consider that mythical 50-year pause between new technology and its adoption by the majority, by looking into the 3E One-Pig Analysis'. For global producers farming their herds completely indoors, heat need never be a cause of the stress that leads ultimately to death BUT insidiously creates massive economic, ethical and environmental cost. The outdoor feeding herd will pay a high price for high temperatures.

As I finish part 4, I invite producers that have read this far, (if any have the time) to consider this. The cost of the technology that is designed to specifically mitigate the expensive impact of heat stress has while skepticism has limited its sales, reduced in relative investment cost as most technologies do. And the more you invest the more it will reduce. Therefore, if there are farmer cooperatives or financial institutions that support agriculture, then this is a time to reconsider and question past doubts. In the coming era (I sincerely hope for) the digital pig will be a sound investment.

More in Part 5.

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