MANAGING GROWTH RATE VARIATION IN ALL-IN:ALL-OUT PRODUCTION

Or **This Little Piggy Went to Market….**

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The problem is simple to explain: We have designed systems with little flexibility and yet we face wide variation in pig-flow and pig performance. It is the age-old problem of putting a square peg in a round hole. Some pigs grow too fast, other pigs grow too slow, and some just do not make it and die or need to be euthanised.

With the square peg – round hole illustration, there are three simple choices:

- The first choice is to make the round hole bigger. This is analogous to increasing the capacity of the system to handle variation. This also means slack space when productivity is low.
- The second choice is to reshape the square peg. This means that the variation in pig productivity is reshaped by compromising pigflow and, in reality, it is the resultant poor performance that needs to be controlled.
- The last choice is to use a big sledge and throw away the parts that chip off. This is analogous to ignoring the problem and then compromising the quality of the process by overcrowding or shipping poor pigs.

Figure 1 shows the distribution of lightweight pigs in a large production system in Southern Minnesota. They occur as the system is either incapable of controlling growth, or its control is in conflict with other aims of the system.

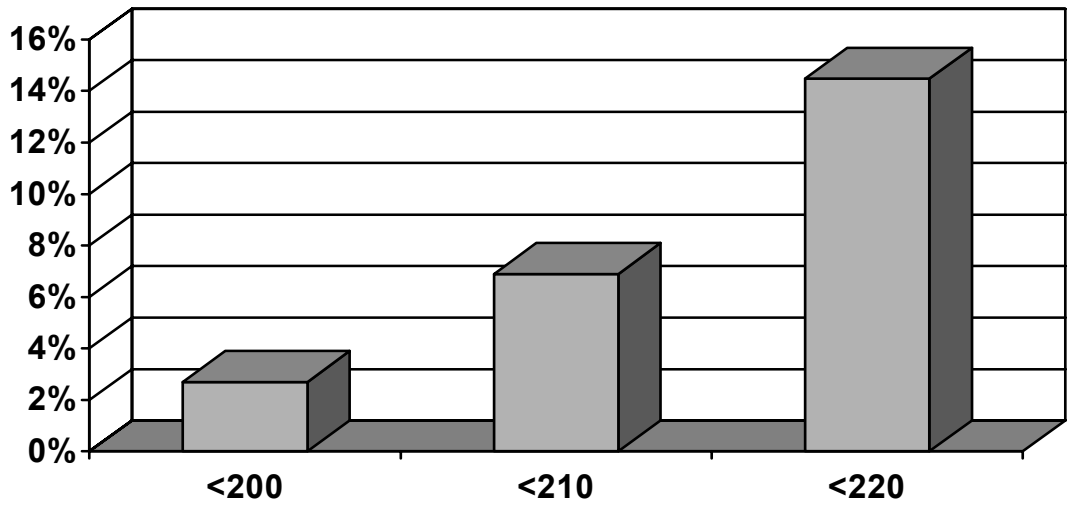

Figure 1. Proportion of lightweight pigs.

The conflicts are numerous in managing a variation in growth rates. We have the conflicts of the aims of:

- Fixed capacity vs. variable production
- Fixed capacity vs. variable specifications
- Cost control vs. quality
- Quality vs. variable requirements
- Maximisation of productivity vs. stability

Such conflicts are common across manufacturing industries. Quality management is the most common approach and a quote from Edward Deming says it best:

> *Improvement of the process increases uniformity of the product, reduces rework in mistakes, reduces waste of manpower, machine time and materials, and thus improves output with less effort. Other benefits of improved quality are lower costs, happier people on the job, and more jobs, through a better competitive position of the company.*

Genichi Taguchi's approach is to create a loss function for deviations from the aim of production. This is an equation for calculating the quality loss of a product. The further the product is from its target state, the greater the loss will be. Figure 2 illustrates one such loss function.

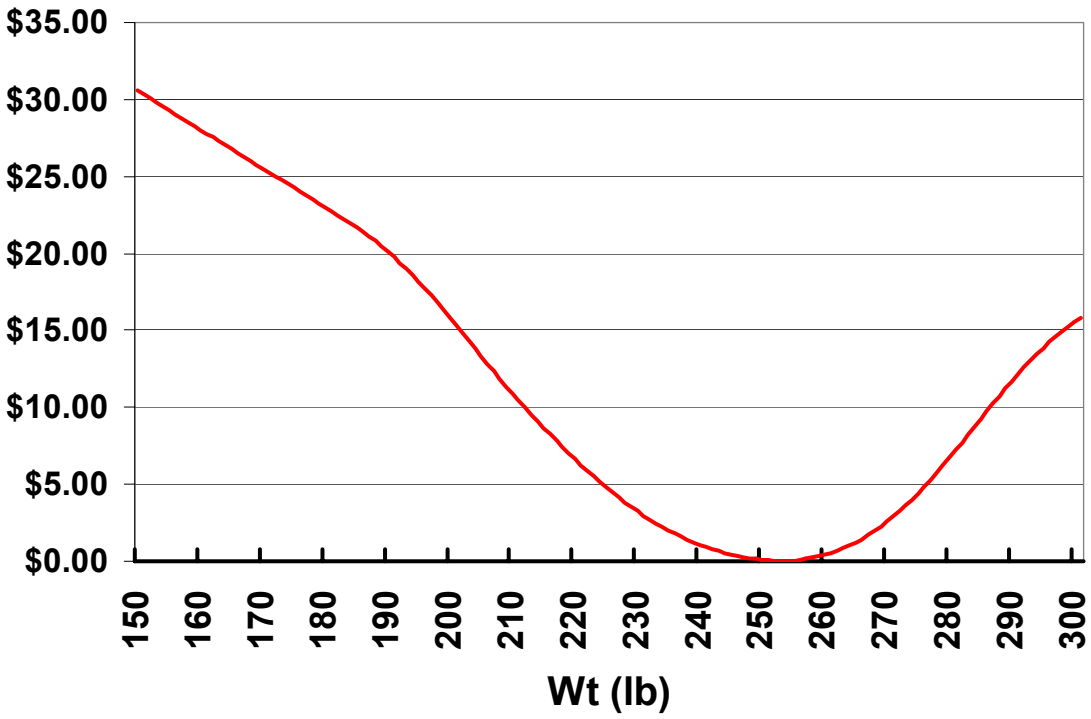

Figure 2. Loss function on marketed pig weights.

The approach that I take for growth variation on most farms is to emphasise the slow-growing pigs. Fast-growing pigs can be sorted out, but slow-growing pigs are difficult to handle in all-in:all-out systems. In this approach I emphasise two aspects at each stage of production. The first is variable weight at entry and the second is variable growth rates. At each stage we have criteria for what is a light pig at entry and at exit. For instance, the common criteria for nurseries is a minimum of 8 lbs. at entry and 30 lbs. at exit.

The big question that we have is whether a light pig performs differently than the other pigs. If so, can we compensate for that poorer growth? In this workshop we will go through some measurement methods and results. Figure 3 shows the results of the comparison of two entry treatments where the differences are real and the treatment effects are also real. Amoxicillin was given in the water and the Ceftiofur was administered by injection at entry. The effect was greater in small pigs and easily justified the treatment. There are many such interventions.

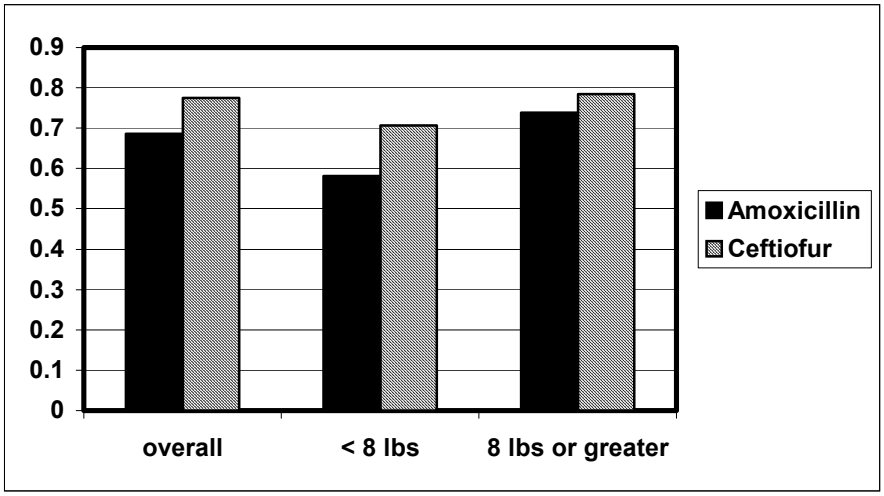

Figure 3. Treatment effects on ADG vs differing entry weights

A few general observations can be made from historic analyses:

- The relationships are farm and/or system specific. The range is large and averages are misleading.
- The relationship between entry weight and growth rate is stronger at younger ages. We need to sort and treat in the farrowing house and nursery. Controlling the growth process is the main aim in g/f.
- Bacterial disease control should emphasise small pigs at entry. Viral disease control does not improve with this emphasis
- We need to measure mortality rates vs. entry weight
- We should look at variable growth as attrition from potential output. Dying or becoming a runt is hard to differentiate by cause and we can often lump them together.

Quality production in this case is profitable and challenging. It is a change in mindset, but it does produce results.