Constipated Barns: Where Has All of the Space Gone?

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Introduction

Throughout North America we are experiencing a shortage of nursery and finisher space. The industry has expanded, and we have export markets to take our extra pork, but shortages of capital and environmental restrictions have limited our ability to meet the demand for new buildings. However, even well-designed facilities of only a decade ago are finding themselves short on space as pigs back up in these 'constipated' barns. Why do we have this shortage of space? How can barns that accommodated the farm's pigs when they were built find themselves inadequate today? There are at least three contributing factors, each of which adds to the problems created by the others.

Let's start with a model barn, a 600-sow farrow-to-finish operation that was so typical of western Canada only a decade ago. When it was built the producer hoped to produce 22 pigs/sow/year. Pigs were weaned at 3 weeks of age, kept in a nursery for 5 weeks, and the finishing wing had 16 rooms. Pigs were marketed at 105 kg. These numbers may vary depending on the producer's province and their preference of production practices, but the example serves our purpose.

Increased Sow Productivity

Six hundred sows producing 22 pigs/sow/year sent 253 pigs to a finishing room every week. Every 16 weeks each room was emptied, cleaned and refilled with a new batch of pigs. In 1995 we dreamed of producing 25 pigs/sow/year but few producers achieved it. Now we do, and we talk of 30. Those same 600 sows, now producing 25 pigs/sow/year, yield 288 pigs/week to fill the same room that was built for 253. The overcrowding due to increased sow production is:

$$((288 - 253) / 253) * 100 = 13.8\%$$

■ Increased Days-to-Market

The target market weight was once 105 kg. Today our market grids require a minimum of 110 kg and in some cases, particularly if feed prices are low, we target 120 kg as the minimum weight for a market pig. At that stage of the pig's life it grows about 1 kg/day, so the extra weight requires another 15 days to market. There has been some increase in ADG during this past decade, but not enough to offset the need for an additional 2 weeks in the finishing barn. Therefore, when new pigs are ready to enter a room, the pens have only been partially emptied. It would take two weeks before the previous pigs are gone. Most farms could use another two finishing rooms to handle the increased days-to-market. The overcrowding due to increased days to market is:

((18-16) / 16) * 100 = 12.5%

■ Increased Size of Pig

While it is true that some production manuals provide a single value for the floor space required for a market pig, the reality is that larger pigs need more space. The Code of Practice and may other standards recommend that as market weight increases the amount of space provided per pig should also increase. It stands to reason that if our barn was based on 0.67 m^2 (7.2 sqft) for pigs marketed at 105 kg, that pigs marketed at 120 kg will require even more. But how much more?

One approach taken to base space allowance on body weight is to use a simple ratio: weight/area. The maximum weight of pigs in a pen occurs on the day that the first pigs are marketed. The average weight of the pigs in the pen is not the target market weight, but about 15% below that level. So the average weight of the pigs when the first few were marketed 10 years ago was about 90 kg. Using 0.67 m^2 per 90 kg pig, we have a weight/area ratio of 135 kg/m^2. Applying that same ratio to today's pigs, with an average weight within the pen of about 105 kg (120 target weight – 15), we would require 0.78 m^2/pig (8.3 sqft). But is this the correct approach?

The poultry industry currently uses a weight/area ratio of about 35 kg/m^2 for broilers. If this standard were applied to pigs, we would need to provide 3 m^2/pig for today's finishing pig. The difference lies not so much with the type of animal, but rather with the size. If we applied our 135 kg/m^2 standard from finishing pigs to 25 kg nursery animals, we would only provide them with 0.18 m^2/pig (2 sqft). These small pigs would be overcrowded. Weight/area standards established for one size of animal will overcrowd smaller animals, but provide less crowded conditions for larger ones.

Floor space is a 2-dimensional value, representing length x width, or area. Body weight is a 3-dimensional value, representing length x width x height, or volume. To transform a 3-dimensional value to its 2-dimensional equivalent you raise it to its 2/3 power. This is termed the allometric approach. The appropriate relationship between floor space and body weight in pigs is:

$$k = \text{area } (m^2) / \text{weight}^{2/3} \text{ (kg)}$$

The appropriate k values for pigs, below which the animals will reduce performance, is 0.0335 (Gonyou et al., 2006). For our example barn, the k value under the original conditions (0.67 m^2, 90 kg average) would have been 0.0333. Applying that same k value to the current sized pigs, that is an average in the pen of 105 kg when the first pigs are pulled at 120 kg, would indicate a space allowance of 0.74 m^2 (7.9 sqft). In other words, to provide the same level of spaciousness to the larger pigs of today as was provided for the smaller pigs of the last decade, we would need to increase space allowance by:

$$((0.74 - 0.67) / 0.67) * 100 = 10.4\%$$

The difference in space requirement using the weight/area vs the more biologically valid allometric approach is 0.04 m^2 (0.4 sqft), or 7%.

■ The Combined Effects

We have seen that the three factors, increased sow productivity, increased days to market, and increased pig size, have increased space needs by 13.8, 12.5 and 10.4%, respectively over the last decade. But what is the overall effect? If we were building a barn to accommodate the production of this unit how much more space would we need?

The previous barn had 16 finishing rooms, each of which accommodated 253 pigs, at a floor space allowance of 0.67 m^2. That resulted in 2,712 m^2 of pig space in the finisher barn (excluding alleys etc.). Building today we would need 18 finishing rooms, accommodating 288 pigs, with a space allowance of 0.74 m^2/pig. The total finishing pig area would be 3,836 m^2. The combined effect of the three factors identified would be to increase finishing space requirements by:

$$((3,836 - 2,712) / 2,712) * 100 = 41.4\%$$

No Simple Solution

Building more finishing space is an obvious means to correct the problem, but how would you do it? Adding two new rooms would address the issue of two extra weeks to market, but the existing rooms would remain overcrowded due to number of pigs and increased pig size. Expanding the existing rooms, in addition to adding two rooms, would be more costly than adding the same space in the form of additional new rooms. A change in pig flow is needed to accommodate the new standards of productivity the farm is achieving.

Lessons for the Future

Wouldn't it have been a good idea to have anticipated changes in production practices when our example barn was built? If only we had known that sow productivity would increase and that pigs would be marketed at higher weights. I was recently asked to look at the plans for a new farrow-to-finish operation. Although productivity in the herd was about what I have described for our example barn, the producer had designed the barn to accommodate 30 pigs/sow/year and market weights of 140 kg. That decision will likely be best appreciated in 15 years time.

Our example also shows that typical farrow-to-finish barns, with weekly finishing rooms, are not very flexible when it comes to coping with increased sow productivity or market weights. Alternative, more flexible pig flows, should be considered when setting up a new operation.

References

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