Use of a Stochastic Model to Evaluate Alternate Marketing Strategies

A. P. Schinckel[1], N. Li[2], P. V. Preckel[2], and D. Miller[2]
Departments of [1]Animal Sciences and [2]Agricultural Economics

Introduction

Pork processors have the objective to produce uniformly sized lean products. Most U.S. pork processors have developed marketing systems to discount carcasses with weights less or greater than the desired optimal range. Pig producers must evaluate alternative marketing strategies that reduce sort loss. The objective of this research was to evaluate the impact of alternative marketing procedures to reduce variation in carcass weight, carcass lean and fat tissue mass, and carcass measurements.

Materials and Methods

One thousand high health SEW gilts were simulated as an example for this research. A stochastic model was constructed to produce live weight, body chemical component, and carcass tissue component growth for each individual pig (Schinckel et al., 2002a,b). Residual variation was added to the predicted values of each variable to represent the measurement errors, which reproduced the total variation of each growth component and carcass measurement variable.

Four alternative marketing strategies were evaluated as to their impact to reduce variation for carcass component mass and carcass measurements. It was assumed that the objective of the producer was to market pigs with an average fat-free lean mass close to 102.1 lb. For multiple day marketings, a sort weight was pre-defined. Any pig with a live weight exceeding that sort weight was marketed. The only exception was on the final marketing day, when all residual pigs were marketed. The target sort weight for each multi-day marketing strategy was found by setting the sort weights at 242, 248 and 254 lb and predicting the mean fat-free lean mass at these weights. Linear regression of fat-free lean mass on sort weight was then used to estimate the sort weight that would result in an approximately 102.1 lbs fat-free lean.

The first marketing strategy was to market all pigs at 160 d of age. The second strategy was to market all pigs above 250.9 lb body weight at 146 d (21.2%; mean = 261.5 lb) and 160 d of age (53.5%; mean = 264.3 lb), and all remaining pigs at 174 d of age (25.3%; mean = 262 lb). The third strategy was to market pigs above 247.6 lb at 146 d (25.8%; mean = 259.3 lb) and 160 d (53.0%; mean = 262.2 lb) of age, and all remaining pigs at 181 d of age (21.2%; mean = 270.4 lb). The fourth strategy resulted in pigs above 256.6 lb marketed on a weekly basis (12.0, 21.9, 28.8, 19.6, and 9.6%; with mean body weights of 266.6, 264.2, 263.7, 264.7, and 264.6 lbs at 146, 153, 160, 167, and 174 d of age) and the remaining pigs (7.1%; mean = 250.7 lbs) marketed at 181 d of age.

Results

For the multi-day marketing strategies, pigs were marketed which had body weights greater or equal to the sort weight, except for the final marketing day in which all remaining pigs were marketed. The overall measure of variation was the standard deviation of all pigs marketed under a specific strategy.

The three multi-day marketing strategies proved to be capable of reducing the standard deviations for body weight and carcass weight (Table 1). The standard deviations of carcass fat-free lean and fat mass were reduced to a lesser extent. This is due to the fact that carcass component mass has two sources of variation: variation in carcass weight and variation in the percentage of the specified carcass component. The weekly marketing strategy resulted in further reductions in the standard deviations for body weight and carcass weight in comparison to the two 3-batch marketing strategies. However, the weekly marketing strategy had little effect to further reduce the standard deviations of any carcass components or measurements.

The example used was for a large single sex group of pigs. With 7 to 14 day differences between barrows and gilts, an additional marketing day would need to be added for a mixed-sex grow-finishing facility to achieve a roughly equivalent variation as the 3-time marketing with a single-sex grow-finishing facility.

The magnitude of between pig variation in days to achieve a constant weight (250 or 260 lb) varies from farm to farm. Pigs reared under lower health status have been found to have more variable growth rates and predicted age to achieve a specified market weight (Schinckel et al., 2002a). The multiple day marketing strategies based on body weight resulted in carcass weight and, to a lesser extent, carcass component mass to deviate from a normal distribution. The economic costs of this variation to the pork producers and pork processor merits further investigation.

Implications

The best compromise for pork producers is to carefully sort pigs three times from a facility with pigs of the same sex. The stochastic model can be used to evaluate alternative marketing strategies that compromise between the pork producer's labor and transportation costs and the pork processors' reduced returns associated with excessive variation in carcass weight and composition.

References

Schinckel, A. P., M. E. Einstein, and B. A. Craig. 2002a. Alternative nonlinear mixed effect models for swine growth. Purdue Swine Research Reports.

Schinckel, A. P., N. Li, E. Einstein, and D. Miller. 2002b. Development of a stochastic pig compositional growth model. Purdue Swine Research Reports.

Table 1. Means and standard deviations for live weight and carcass measurements with alternative marketing strategies

	160 d		146, 160, 174 d		146, 160, 181 d		146-181 d, weekly	
	Mean	**SD**	**Mean**	**SD**	**Mean**	**SD**	**Mean**	**SD**
Live weight, lb	263.2	20.1	263.0	9.5	263.2	10.4	263.0	6.6
Carcass weight, lb	200.1	17.0	199.8	8.4	199.0	9.0	200.1	6.0
Fat-free lean, lb	102.1	9.0	102.1	7.3	102.0	7.5	102.2	7.0
Percent fat-free lean	51.0	3.2	51.1	3.1	51.1	3.1	51.0	3.0
Total carcass fat, lb	61.5	10.4	61.3	7.9	61.2	7.9	61.3	7.7
Fat depth, 10^{th} rib, in	0.88	0.132	0.87	0.112	0.87	0.114	0.87	0.101
10^{th} rib loin muscle area, in^2	6.73	0.53	6.71	0.41	6.71	0.40	6.73	0.38
Optical probe fat depth, in	0.83	0.12	0.83	0.100	0.83	0.098	0.83	0.097
Optical probe muscle depth, in	2.13	0.12	2.13	0.112	2.13	0.11	2.13	0.108

All pigs marketed at 160 d of age.
Pigs above 250.9 lb marketed at 146 and 160 d and the remaining pigs at 174 d of age.
Pigs above 247.6 lb marketed at 146 and 160 d and the remaining pigs at 181 d of age.
Weekly marketing of pigs above 256.6 lb from 146-174 d with marketing of the remaining pigs at 181 d of age.
Data based on simulation of 1000 pigs.