OPTIMUM SOLUTIONS FOR GROWER-FINISHER PIGS

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ABSTRACT

Dynamic integrated models, such as Watson®, are available and being used to improve performance and profitability of finishing pigs by enhancing the decision-making process. One of the main purposes of an integrated management approach is to bring together the complex interactions between the animal, its environment and its diet, into a system that will accurately predict the animal's performance under commercial conditions. Applying this technology will predict 1) the cause-and-effect responses to changes in the production environment; 2) the subsequent financial implications of these changes; and therefore, 3) the optimum nutritional and/or financial strategy. It is important to note that optimum solutions are farm-specific and no one solution fits all because of the inherent differences in production characteristics on each farm (e.g health status, genetics, housing, ingredient/feed costs). The judicious use of these integrated management models can and does assist the producer make better decisions, in a constantly changing production environment, as well as assign financial consequences to the decision-making process. A number of different optimum strategies focusing on nutrition, feed management and marketing are presented as well as examples of their on-farm application.

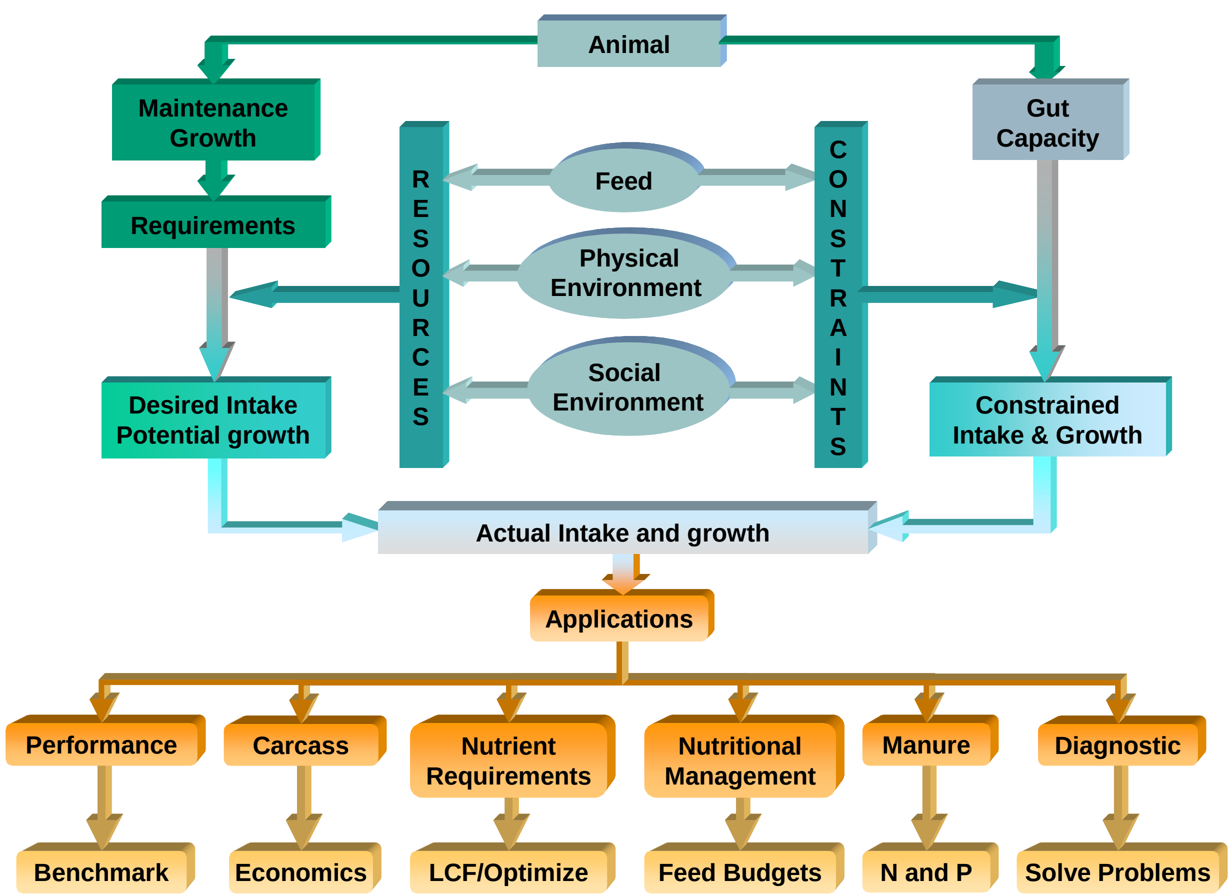
INTRODUCTION

The ability to predict or simulate the optimum solution to an animal performance problem, financial outcome or nutritional requirement, depends on 1) the integrity of the input data used to define the original problem; 2) the accuracy of the system used to measure the biological responses, and 3) the expected outcomes to be reported. The integration of these three components, therefore, should form the foundation of any model or system used to predict animal growth. Simulation of swine growth for the purposes of predicting the responses of pigs to nutrient inputs has come a long way since the first conceptual frameworks were published by Whittemore and Fawcett (1976) and Emmans (1981). A number of models differing in complexity and application have been reported in the scientific literature each with their own description of growth and predictive objectives (Black et al., 1986; Pomar et al., 1991; Ferguson et al., 1994; Moughan et al., 1995; Birkett and de Lange, 2001; Green & Whittemore, 2003; Wellock et al., 2003). The successful application of these models into practice has varied due to their complexity, ease of use and the robustness of their scientific theory under commercial conditions. Despite the varying degrees of success, there is no doubt that the integrated approach to predicting growth and feed intake, significantly enhances the management decision-making process and allows for the prediction of optimum solutions in grower-finisher production. By rapidly quantifying both the technical and financial outcomes to production stimuli, the need for educated guessing is eliminated. It is for this reason that Watson® was developed as a decision-making tool to improve the performance and productivity of hog finishing operations.

WATSON® OVERVIEW

Watson® was developed by integrating the science and practice of pig production into an easy to use Web-based software application. The science and theoretical framework has been published (Ferguson et al., 1994; Wellock et al., 2003) and extensively validated, with over 20 trials conducted to test significant drivers and components of the model. Its framework is unique and flexible to allow the prediction of voluntary feed intake, as well as predicting performance and financial outcomes reasonably accurately under commercial conditions. For a detailed description of the program refer to Ferguson (2006). The key components and the commercial applications of the model can be summarized in Figure 1.

Figure 1. The framework summarizing the key components and commercial applications of an integrated management model (Watson®).



The main purpose of an integrated management model is to bring together the complex interactions between the animal, its environment and its diet, into a system that will accurately predict the animal's performance under commercial conditions. Applying this technology will predict 1) the cause-and-effect responses to changes in the production environment; 2) the subsequent financial implications of these changes; and therefore, 3) the optimum nutritional and/or financial strategy, unique to the individual producer. It is important to note that optimum solutions are farm-specific and no one solution fits all because of the inherent differences in production characteristics on each farm (e.g health status, genetics, housing, ingredient/feed costs).

OPTIMUM SOLUTIONS

Nutrition Strategies

Some of the nutrition strategies that can be optimized include: 1) nutrient requirements based on a) the producer's objective (economic or performance), b) different feed budgets, and c) different nutrient density of the diets; 2) minimizing under and over-feeding nutrients; and 3) the use of ractopamine (e.g Paylean®). Of particular importance is the ability to define optimum nutritional strategies based on current feed ingredient prices as well as future ingredient prices. Therefore, responses in gross profit to changing energy density and/or the lysine:energy ratio of the diet can be predicted over time and the results used to change the nutritional strategy to maintain the optimum solution.

Feeding Management Strategies

A feeding budget should be designed and implemented to optimize the producer's objective (which could vary from higher gross profits per pig or per annum, lowest feed costs/kg gain, faster growth rates or best feed efficiency). Using an integrated management model it is possible to predict the optimum feed budget based on cost versus nutrient requirement for any growth period. This is done by comparing the performance and financial responses to different diets and their respective feed budgets, and allowing the producer to select the feeding program that best meets his/her production objectives.

One of the consequences of being able to predict daily feed intake and body tissue deposition is the ability to dynamically determine the amount of nutrients excreted, especially nitrogen and phosphorus excretion. With each simulation it is possible to determine the total amount of N and P that is excreted per pig per closeout period. Where N and P excretion are closely regulated, Watson® can be used to develop feeding programs, including diets and feed budgets, that will reduce their excretion. A simple example is moving from a 2-phase to a 3-phase feeding program can reduce N excretion by 90-160g/pig which translates into a 240-430kg N reduction per year, respectively, for a 1000 pigs per closeout barn.

Integrated management tools are also helpful in identifying production problems, provided the simulation process is performed on a daily basis. Examination of the daily predicted results can assist in identifying constraining factors that are possibly limiting performance.

Appropriate corrective action to these production problems can then be developed and implemented.

Financial Strategies

Fundamental to any economic optimum solution in finishing hogs is the incorporation of a predefined grading grid and the variation of the carcass components, used to determine the index and/or bonus incentives, associated with a group or population of pigs shipped to market. Accurate estimates of the variation of carcass weight, lean yield, back fat and loin muscle depth are key to the accuracy of determining profit or loss margins. Fortunately, reasonable estimates of these deviations can be calculated from the data sheets the producer receives from the slaughter plant(s). With Watson® it is possible to simulate market performances for any predefined grading grid and thereby determine the financial consequences of any production change such as feed costs, health, stocking density and housing, genetics and marketing. For example, it is possible to determine the optimum average market live weight a producer should target at present, which may or may not be the same live weight in a year's time. Clearly, as feed and hog prices change so too will the optimum marketing strategy change for a producer (Figure 2).

Figure 2. Predicted market weight response to changes in feed prices for different processors when hog prices are $1.10/kg. (Low = -$30, High = +$30/MT).

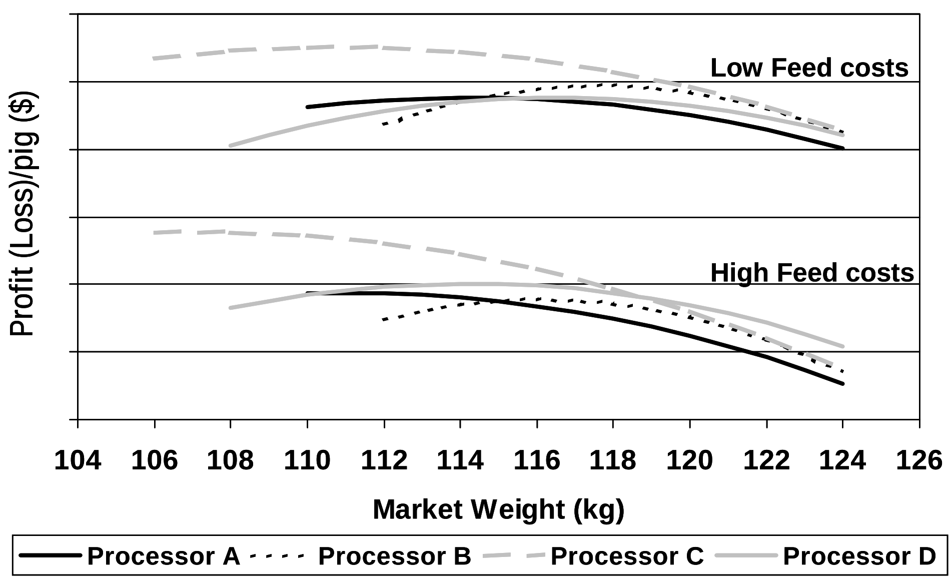


Figure 2 indicates that the average hog shipping weight, to provide the highest gross profit, may be lower (-4 kg) when feed prices move up. Similarly, Table 1 illustrates the effect on margins when there is a simultaneous change in both feed and hog prices. The extent of the change will depend on the specific packer to which the hogs are being shipped. There are also opportunities to ship barrows and gilts at different weights. Once again the optimum market strategy will be producer-specific because of the unique production characteristics of each farm.

Table 1. Predicted relative losses associated with shipping to a fixed market weight when hog and feed prices change.

Scenarios		Processor A (117 kg)		Processor C (114 kg)	
		Loss/Pig	Optimum Wgt	Loss/Pig	Optimum Wgt
Hog Price	Feed Costs	$	kg	$	kg
Average		0	117	0	114
Low	High	-$1.39	110-112	-$1.61	106-109
Low	Low	-$0.28	113-116	-$0.33	109-112
High	High	0	115-118	0	113-116
High	Low	-$0.33	118-121	-$0.49	116-119

(Average: Hog Price=$1.50, Feed costs = $230-$250/MT; Hog Price: Low = $1.10, High = $1.70; Feed Costs: Low = -$30, High = +$30/MT).

CONCLUSIONS

To successfully produce pigs in an increasingly volatile market, attention will need to be directed toward developing optimum nutrition, management and financial strategies through more informed decision-making processes. Therefore, the ability to make better decisions in this constantly changing production environment will become increasingly dependent on the application of integrated management models, like Watson®. These integrated systems can dynamically simulate the whole production process and thereby predict the cause and effect responses to the specified driver(s) of change, and attach a financial consequence to the decision-making process. This will enable and empower producers to develop their own optimum solution to their specific production system.

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