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Articles in the field of agricultural economics, suitable for publication in the journal, will be welcomed.

Articles should have a maximum length of 10 folio pages (including tables, graphs, etc.) typed in double spacing. Contributions, in the language preferred by the writer, should be submitted in triplicate to the Editor, c/o Department of Agricultural Economics and Marketing, Private Bag X250, Pretoria, 0001, and should reach him at least one month prior to date of publication.

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# THE ECONOMIC SELLING WEIGHT OF PIGS

by

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## 1. INTRODUCTION

Unlike crops such as maize that are affected by weather conditions, a great amount of control can be exercised in the production of pork. Pork production therefore lends itself ideally to economic analysis. The throughput in a modern piggerly is fairly fast with sows being able to produce two litters a year, so results of experiments are available in a reasonably short period of time.

The purpose of this paper is to determine the economic optimum weight at which baconers should be sold. Results were obtained from tests carried out at the Animal and Dairy Science Research Institute, Irene, on 50 pigs (25 barrows and 25 gilts).

## 2. EXPERIMENTS

Briefly, tests were carried out as follows. Pigs were bought from pig breeders at an age of approximately eight weeks. The test began when pigs reached a weight of 31 kg. The pigs first received a 'growth' ration containing about 18% protein. Weekly weights and feed intakes were accurately recorded. The ration was changed to a 14% 'finisher' ration when a weight of 50 kg on average was reached. This ration was fed until slaughter at an average weight of 92 kg. The price of feed was therefore taken as the price of the finisher ration in the determination of the optimum weight at which to sell. In determinations of the costs of feed consumed, however, both prices (growth and finisher) were used.<sup>1</sup>

The price of pork was taken as the warm dressed weight price for grade 1 baconer pigs. The other grades are not considered to simplify the analysis; however, this will not alter the analysis a great deal as almost 80% of all the baconers sold by modern commercial pig farmers are grade 1.<sup>2</sup>

## 3. A FEED/PIG PRODUCTION FUNCTION

In the following production function, total gain in weight per pig of 50 pigs is related to feed consumed since feeding started at a weight of 31 kg.

The high  $R^2$  indicates that 99,9% of the variation in pig weights can be explained by level

$$P = 0,35606 + 0,45146 F - 0,00067F^2 \quad (1)$$
$$R^2 = 0,99892$$

P = pork in kg  
F = feed consumed in kg per pig

of feeding. This implies perfect environmental control and that no other effects apart from the level of feeding affected the weights of the baconers. This can be compared with the relatively low  $R^2$ s that are obtained in maize/fertiliser trials because of weather changes. The production function fitted is highly significant and conclusions can thus be drawn from it with great confidence.

It is important to note at the outset of the analysis that the values of P refer to weights after the start of the trials. The true weight of a pig can be obtained by adding 31 kg to the weights obtained in the analysis. The average weight of the pigs and feed consumed during the 13 weeks of feeding are presented in the first two columns of Table 1. Columns 3 and 4 show declining average and marginal products of successive levels of feeding. The declining average products imply that the feed conversion ratio, which is the inverse of the average product, increases since feeding started. This diminishing returns relationship is further illustrated by the feed/pig production function in Fig. 1.

TABLE 1 - Total, average and marginal products for tests carried out on 50 pigs starting at 31 kg (Irene, 1972)

Weeks	Feed consumption (F) kg	Total product (P) kg	Average product kg	Marginal product kg
1	8,274	3,728	0,489	0,440
2	17,654	7,947	0,460	0,428
3	27,415	12,392	0,446	0,415
4	38,882	17,209	0,435	0,400
5	51,519	21,945	0,424	0,383
6	65,209	27,130	0,413	0,365
7	79,960	32,187	0,402	0,345
8	95,454	37,349	0,391	0,324
9	111,684	42,547	0,380	0,303
10	128,612	47,650	0,368	0,280
11	147,182	52,136	0,355	0,256
12	164,618	55,017	0,343	0,233
13	181,111	61,530	0,332	0,211

#### 4. DETERMINING OF OPTIMUM SLAUGHTER WEIGHT

At the economic optimum selling weight the marginal revenue obtained from utilisation of feed must be equal to the marginal cost of feed. This statement is equivalent to saying that the marginal product of feed must be equal to the ratio of feed pork prices at the optimum point.

The optimum level of feeding per pig can thus be calculated from equation 1 as

$$\frac{dP}{dF} = 0,45146 - 0,00133F = 0,14574 = \frac{\text{price of feed}}{\text{price of pork}} \quad (2)$$

If this equation is solved, the optimum level of feeding is calculated as 229,86 kg after 14,6 weeks of feeding. This amount of feed is required to raise a baconer from 31 kg to the slaughter stage. By substitution of this level of feed into production function 1, the optimum slaughter weight is calculated at 68,75 kg. The final slaughter weight for each baconer is then  $(31 + 68,75) = 99,73$  kg.

The effect of changes in baconer and feed prices on the optimum weight can be determined. Any change in price will give a different price ratio in (2) and appropriate values for F and P can be calculated as shown above.

Table 2 shows various optimum selling weights for the different prices depicted on the sides

of the table. The body of the table contains optimum selling weights. Optimum selling weights increase with an increase in baconer prices and a decrease in feed prices.

TABLE 2 - Effects of price changes on selling weight

Liveweight baconer prices cents/kg	Feed prices in cents/kg		
	7	7,87	10
70	104,07	102,90	100,04
60	102,54	101,22	97,31
54	101,37	99,73	94,88
50	100,34	98,42	92,76

#### 5. EXPLANATION OF RESULTS

It will be noted that the above analysis gives an optimum selling weight of 99,73 kg, whereas pigs are in fact sold at an average weight of 92,53 kg 13 weeks after the start of the test.

What are the reasons for this apparent discrepancy between theory and practice?

In the analysis the only cost considered is feed cost. In practice other costs such as labour, veterinary expenses and housing, etc., will be included. The inclusion of these costs will have the effect of shifting the marginal cost curve upwards

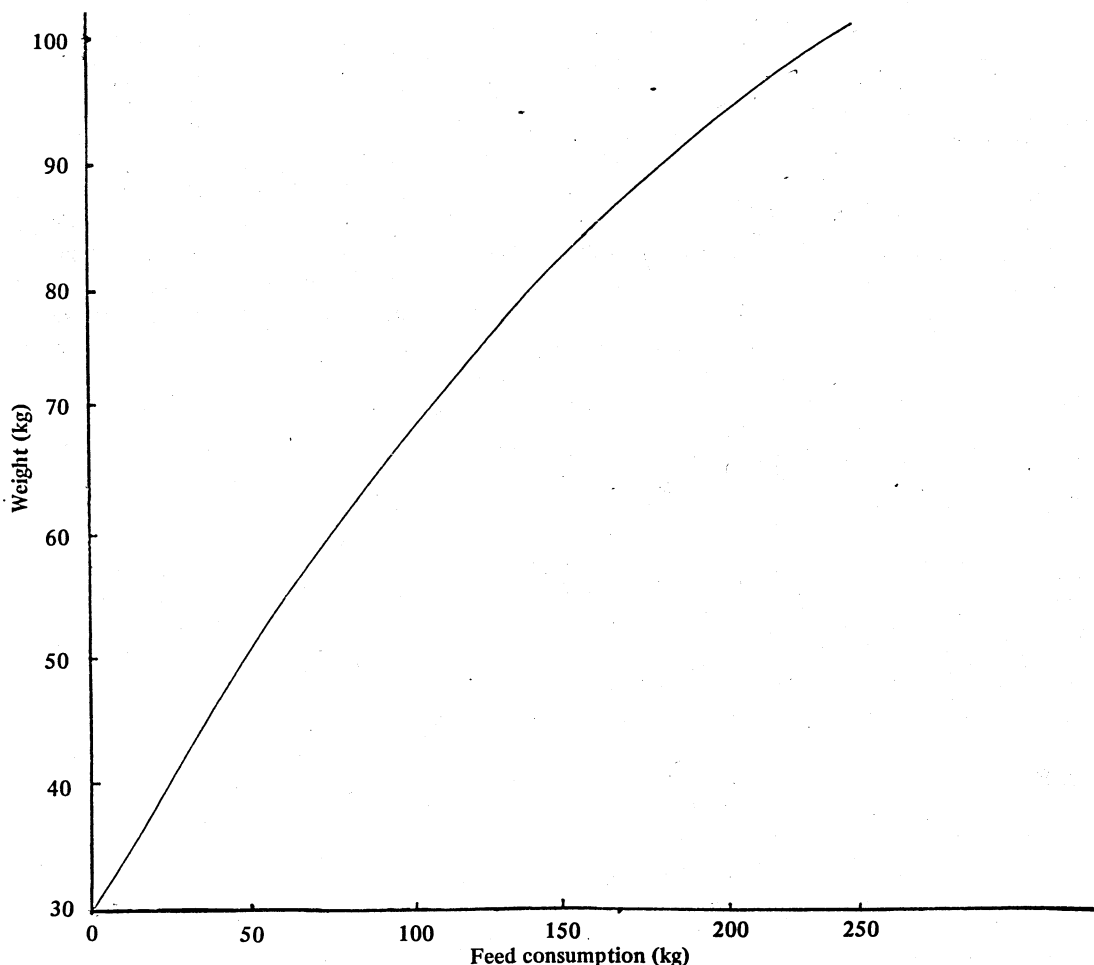


Fig. 1 - A feed/pig production function, Irene, 1972

causing it to cut the marginal revenue curve (which is the price of pork) further to the left, meaning that the optimum selling weight is reduced. The optimum selling weight should probably be lower than the weight calculated when feed is considered as the only input factor. Note that reducing optimum selling weight is the same as reducing optimum selling age. Selling at an earlier age will increase annual throughput of pigs.

The "optimum" slaughter weight of 99,73 kg, as determined in section 4, should then be considered as an upper bound, i.e. pigs should not be fed beyond this level. If pigs are slaughtered earlier, total profits may be higher because of a higher throughput and the fact that the average product curve is falling. The practice of selling pigs at an average weight of about 92,5 kg appears to be economically sound.

## 6. DISCUSSION AND CONCLUSION

Intensive pig production appears to lend itself ideally to economic analysis. It was possible to attribute 99,9% of the variation in pig output to levels of feeding. This also implies complete environmental control which is not possible in

other experiments such as maize/fertiliser trials where the weather has an important effect on the final yield.

The optimum slaughter weight of a baconer was calculated at 99,73 kg. At this weight, the highest profit per pig is realised. If pigs are slaughtered at an earlier age, the throughput may be faster and total profits may be more. Furthermore, pigs put on more fat, relatively speaking, at later stages which leads to downgrading of the carcass. The practice of selling pigs at about 92-93 kg at Irene appears to be economically sound.

## REFERENCES

1. According to Meadow Feed Mills Ltd, Pietermaritzburg, the commercial bulk price of a 17,5% protein growth ration collected at the feedmill was 8,88c/kg and the price of a 14% protein finisher ration 7,87 c/kg
2. This information was obtained from Eskort Bacon Co-operative Ltd (1974). The warm dressed weight was taken as 72c/kg, which is equal to 54c/kg liveweight, assuming that dressed weight is 75% of liveweight.