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ECONOMIC EVALUATION OF PORCILIS APP IN FATTENING PIGS

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Au cours d'un essai terrain, la vaccination contre l'actinobacillose porcine a augmenté les performances des porcs à l'engrais : gain de poids, croissance, mortalité. Le but de cette analyse économique était d'en évaluer les coûts et les avantages. Pour cela, on a chiffré le poids économique des paramètres à partir d'une approche budgétaire partielle. Ces poids ont été déterminés pour une porcherie hollandaise typique, avec un gain de poids quotidien moyen de 730 g, une période d'engraissement de 119 jours, un taux de conversion alimentaire de 2,8, un prix de vente de 3,25 florins/kg de carcasse et un prix d'aliment de 0,42 florin/kg. Le bénéfice net pour le travail et la gestion est alors de 13 florins par porc. Avec l'approche budgétaire partielle, une augmentation de 0,1 point dans le taux de conversion représente un poids économique de 3,65 florins, une perte de 25 g de croissance, 2,75 florins et 1% de mortalité, 2,20 florins. L'augmentation des paramètres de production après vaccination par Porcillis APP est vraie en cas de forme chronique comme en cas de forme aiguë. Quand les deux formes coexistent, cela donne un gain de 0,12 pour le taux de conversion, de 30g/jour pour le taux de croissance et la mortalité s'améliore de 1,6%. Les coûts des médicaments baissent de 3,90 florins par animal. Le gain total de la vaccination est de 15,10 florins par porc. En cas de maladie chronique seule, le gain est de 9,36 florins. Le coût de la vaccination est de 4 à 6 florins par porc. La vaccination par Porcillis APP se révèle donc très intéressante du point de vue économique, même à des niveaux de prix beaucoup plus bas. Le seuil de rentabilité entre coûts et bénéfices est atteint avec des améliorations beaucoup plus minimes en situation de production qu'en essai terrain, ce qui plaide solidement en faveur de la vaccination.

INTRODUCTION

In a field research experiment of the Intervet company, vaccination against APP showed to improve the major performance parameters in fattening pigs, such as daily weight gain, feed conversion rate and mortality. Improvements in performances after vaccination were available from compartments with both acute and chronicle outbreaks of APP, and compartments with chronicle outbreaks only. With acute and chronicle outbreaks together feed conversion improved by 0.12, daily weight gain by 30 grams and mortality by 1.6%, whereas costs for medicines (antibiotics) reduced by Dfl. 3.90 per pig. In the chronically infected compartments (without mortality or clinical APP outbreaks) feed conversion improved by 0.08 and daily weight gain by 25 grams, whereas costs for medicines reduced by Dfl. 3.69 per pig.

The question then was whether these (small) improvements in technical performances were big enough to pay for the cost of vaccination. To carry out a cost/benefit analysis, first a computer spreadsheet model was developed to derive economic weights for each of the parameters, using the partial budgeting technique. Partial budgeting is simply a quantification of the economic consequences of a specific change in farm procedure, such as vaccination against APP (Dijkhuizen and Morris, 1997). The economic weights were then combined with the improvements in technical performances, added, and compared to the cost of vaccination. The economic calculations were carried out for a typical commercial Dutch farm, but can easily be modified to other farm and price conditions. In this paper the basic principles of such an approach and the outcome will be presented and discussed.

DERIVING ECONOMIC WEIGHTS FOR PERFORMANCE VARIABLES ON PIG FATTENING FARMS

Typical results commercial Dutch pig fattening farms

As summarised in Table I, a typical commercial pig fattening farm in the Netherlands has a herd size of about 1800 fattening places. The weight of the piglets at the start of the fattening period is on average 25 kg. Fattening pigs are slaughtered at a live weight of 112 kg, implying a slaughter weight of 87 kg. The duration of the fattening period is 119 days, which means that the average daily weight gain is 730 grams and that there are 2.8 deliveries (fattening rounds) per year. The mortality rate is 2.8%, and hence a total of 5000 fattening pigs are sold per farm per year. Feed conversion, defined as kg of feed per kg of growth, averages 2.8.

Gross return per kg of slaughter weight varies considerably, but is typically about Dfl. 3.25, which leads to a gross return per fattening pig of Dfl. 283. Feed price is Dfl. 0.42 per kg, which adds to total feed costs of Dfl. 103 per fattening pig. The purchase price for piglets (at 25 kg) is on average around Dfl. 100 per head. Net return to labour and management per fattening pig averages Dfl. 13, which is 4.5% of the gross return.

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Table I
Typical results for commercial Dutch pig fattening farms.

Herd size (number of fattening places)	1800
Starting weight (kg)	25
Live weight at slaughter (kg)	112
Slaughter weight (kg)	87
Daily weight gain (grams)	730
Length of fattening period (days)	119
Number of fattening rounds per year	2.8
Feed conversion efficiency (kg of feed per kg of weight gain)	2.8
Mortality rate (%)	2.6
Number of fattened pigs sold per year	5000
Gross returns per fattened pig sold (Dfl.)	283
Net return to labour and management per fattened pig sold (Dfl.)	13
Income margin (%)	4.5
Purchase price piglet (Dfl.)	96
Selling price fattened pig per kg slaughter weight (Dfl.)	3.25
Feed price per kg (Dfl.)	0.42

Feed conversion efficiency
A difference in feed conversion ratio of 0.1 affects feed consumption by 0.1 x (112 - 25 kg) = 8.5 kg per fattening pig sold and income by 8.5 kg x Dfl. 0.42 = Dfl. 3.65 per head. This equals (Dfl. 3.65 / Dfl. 13) x 100% = 28% of typical net return to labour and management (Table I). The difference in feed conversion efficiency between the 20% best and the 20% worst performing farms in the Netherlands is about 0.25, and, therefore, causes a total difference in income of 0.25/0.10 x Dfl. 3.65 = Dfl. 9.13 per fattening pig sold. This equals 70% of net return to labour and management on a typical fattening farm.

Daily weight gain
In quantifying the economic impact of differences in daily weight gain, it is necessary to determine which single cost item on a farm is related to the length of the fattening period, and which is not. Purchase price of the piglet and cost of transportation of the fattened pig are examples of costs which are not related in this way. Moreover, no relationship should be included for total feed costs, because differences in this parameter manifest themselves already in the feed conversion efficiency and thus should not be counted twice. The other cost items are more likely to be related to the length of the fattening period. So, the income margin per day of fattening period in the starting situation equals: gross return - (purchase price piglet + feed costs + cost of transportation) = Dfl. 283 - (Dfl. 96 + 103 + 5) = Dfl. 79 in 119 days or Dfl. 0.66 per day. A 10-gram increase in daily weight gain decreases the initial fattening period by 1.6 days, implying an economic value of 1.65 x Dfl. 0.66 = Dfl. 1.10. With a 10-gram decrease in daily weight gain these values are about the same. So, the economic value per gram of daily weight gain equals about Dfl. 0.11. Considering the upper and lower bounds of the 20% best and 20% worst performing farms in the Netherlands this implies a difference in income of Dfl. 7.70 per fattening pig sold. Such a difference equals about 60% of net return to labour and management on a typical fattening farm, ranking second after feed conversion efficiency.

Mortality rate
Assuming that, on average, mortality occurs halfway the fattening period, the losses include:

- costs before death: purchase price piglet + 59.5/119 x (gross return - purchase price piglet) = Dfl. 96 + 0.5 x (Dfl. 283 - 96) = Dfl. 189.50; and
- return to labour and housing foregone after death: 59.5/119 x (housing + labour + net profit) = 0.5 x (Dfl. 60) = Dfl. 30.

So, in total, these costs average Dfl. 219.50 per dead fattening pig, or Dfl. 2.20 per percentage of fattening pig mortality. For the corresponding differences between the 20% best and 20% worst performing farms in the Netherlands this implies a difference in income of Dfl. 4.20 per fattening pig sold. This difference equals 32% of net return to labour and management on a typical fattening farm, ranking third after feed conversion efficiency and daily weight gain.

Summary of the economic weights
The outcome of the economic weights for the three performance variables under consideration (i.e., feed conversion efficiency, daily weight gain and mortality rate) are summarised in Table II. They are also calculated and presented for a (much) lower price level of piglets and fattening pigs, as was the case in most of the last few years.

Table II
Economic weights of performance variables in pig fattening.

Selling price fattening pig (Dfl. per kg slaughter weight)	3.25	2.60
Purchase price piglet (Dfl. per head)	96.00	78.00
Feed conversion efficiency (Dfl. per 0.1)	3.65	3.65
Daily weight gain (Dfl. per 10 grams)	1.10	0.55
Mortality rate (Dfl. per %)	2.20	1.65
Typical net return to labour and management (Dfl. per head)	13.00	-25.00

As shown in Table II, economic weights of daily weight gain and mortality rate decrease considerably with lower prices for piglets and fattening pigs, as does the typical income on fattening farms. Weights for feed efficiency remain unchanged, and hence become relatively more important with lower prices for the animals.

COSTS AND BENEFITS OF VACCINATION

As indicated before, improvements in performance variables after vaccination against APP were available from compartments with both acute and chronicle outbreaks of APP, and from compartments with chronicle outbreaks only. The technical effects were multiplied with the economic weights, calculated in the previous section, and summarised in both situations. The outcome is presented in Table III.

Table III
Effects of vaccination against Porcilis APP.

	Acute and chronicle infections			Chronicle infections only		
	Technical effects	At normal price levels	At low price levels	Technical effects	At normal price levels	At low price levels
Feed conversion	-0.12	+Dfl. 4.38	+Dfl. 4.38	-0.08	+ Dfl. 2.92	+ Dfl. 2.92
Daily weight gain (g)	+30Dfl. 3.3	+Dfl. 3.30	+Dfl. 1.65	+25	+ Dfl. 2.75	+ Dfl. 1.38
Mortality rate (%)	-1.6	+Dfl. 3.52	+Dfl. 2.64			
Less medicines		+Dfl. 3.90	+Dfl. 3.90		+ Dfl. 3.69	+ Dfl. 3.69
Total		+Dfl. 15.10	+Dfl. 12.57		+ Dfl. 9.36	+ Dfl. 7.99

As shown in Table III, vaccination against APP turns out to be economically very attractive. Compartments in which acute and chronicle infections are present show economic benefits of Dfl. 15.10 per pig at normal price levels and Dfl. 12.57 at lower price levels. These benefits are Dfl. 9.36 and Dfl. 7.99 respectively in compartments with chronicle infections only. Costs of vaccination are between Dfl. 4 and Dfl. 6 per pig. So, the benefits are much higher than the costs and hence could be considerably lower before the break-even is reached.

FINAL REMARKS

Small changes in technical performance levels in pig fattening have an enormous effect on the income of pig farmers, as shown in this paper. For Dutch conditions, a 0.1-change in feed conversion ratio affects the farmer's income by 28%; a 25-gram difference in daily weight gain by 21%, and a 1%-point in mortality rate by 17%. Similar outcome were found for US conditions (Rougoor et al., 1996).

Partial budgeting was found to be a worthwhile tool to transform improvements in technical performance because of vaccination against APP into economic results. Results show that the benefits of vaccination to the farmer are much bigger than the costs, and hence vaccination is very attractive from an economic point of view even at lower price levels and with smaller effects in technical performances. Built into a spreadsheet model, the approach is simple to use for on-farm advice about vaccination against APP.

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