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ECONOMIC WEIGHTS FOR RABBIT SELECTION INDICES

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ABSTRACT

In this paper a profit equation for rabbit production is offered and economic weights are derived. We have considered the profit function as PROFIT = RETURNS - COSTS. To derive the economic weights, the profit is considered as a function of several traits ($x_1, x_2, x_3, \ldots$). The economic weight w_i of the trait x_i is the partial derivative of the profit function applied in the mean value of the traits. Several souces have ben used for the mean values which characterize rabbit production. The profit function has been calculated taking in account all the parameters acting in modern rabbit production. Therefore, only the means need to be changed to calculate new economic weights .

INTRODUCTION

Since the first appearance of the economic weights of traits for selection, suggested by Ronald Fisher to Farfield Smith (Smith, 1936), several papers have discussed the way to derivate them (see Smith et al., 1986). for review and discussion). Rather surprisingly, little work has been done on this topic in rabbits. In this paper a profit equation is offered and economic weights are derived.

PROFIT FUNCTION

We have considered the profit function as

PROFIT = RETURNS - COSTS

To derive the economic weights, the profit is considered as a function of several traits

PROFIT = $f(x_1, x_2, x_3, \ldots)$

The economic weight w_i of the trait x_i is the partial derivative of the profit function applied in the mean value of the traits.

$$w_i = \left[\frac{\partial PROFIT}{\partial x_i}\right]_{\bar{x}}$$

Tables 1 and 2 show the variables considered and their mean values. Table 3 has the detailed deduction of the profit function. Table 4 gives the economic weights in pesetas, US dollars and Ecus.

SOURCES

Several souces have ben used for the mean values which characterize rabbit production. Mortalities, number of deliveries per year, replacement rate and commercial body weight were taken as the average of 15 farms with more than 200 females each one, having removed extreme cases. The prices are the average prices in the east coast of Spain -which is the main area of rabbit meat consumption-, but these prices are very similar in the whole country. Daily gain and food consumption come from several experiments of the Animal Science

unit of our Department, and will be shortly published. Fixed and labour costs come from a detailed study of a Company (A. Rey, unpublished). Litter size was taken from the 400 does selection nucleus of the Animal Breeding unit of our Department.

DISCUSSION

We are not discussing in this paper the usefulness of the profit functions and the different ways to calculate economic weights, both topics have been extensively considered by Harris (1984) and Smith et al. (1986). However, two important questions for discussion are how general this profit function would be and how sensitive to errors in the mean values.

It is obvious that the profit function is more sensitive to changes in some parameters like food consumption or number of deliveries per year than in others like health costs or daily gain during lactation. After offering a profit function it is convenient to study the robustness to changes in the values of its parameters, mainly the parameters which will produce changes in the economic weights -this is being calculated now and will be shortly presented.

Index of selection are quite robust to errors in economic weights (Smith, 1983). Therefore, to calculate particular economic weights applied to particular situations will be justified only when there are differences in the parameters of the profit function which will lead to substantial differences in economic weights. Althoug selection programs are developed to supply does and bucks for intensive rabbit production systems, the marketing conditions can vary between countries more than the conditions for poultry or pigs, and the prices considered here might be substantially different in other markets. Other aspects like litter size or replacement rate nedd less changes, because -as pointed out by Smith et al. (1986)- the profit function should be calculated for situations in which improvements by means different from selection have been already done -for example, litter size can be improved from 6 to 9 youn rabbits by using the right food, management and genetic material, and thus selection will act to improve litter size in more than 9 young rabbits-. The argument is that selection for traits to redress inefficiencies in a production system is of specific and temporary value rather than of general value.

The only results related to profit functions that we have found have been recently published by Koehl (1991). Only some weights can be deduced from this paper, but these economic weights are very similar to the weights we have found.

The profit function has been calculated taking in account all the parameters acting in modern rabbit production. Therefore, to calculate new economic weights for different markets only the means need to be changed.

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TABLE 1. Variables related to variable costs

		Mean value
	Mortalities	
WM	Mortality rate from birth to weaning	13%
FM	Mortality rate from weaning to slaughtering	5%
MM	Mortality rate for adult rabbits	5%
	Prices	
P1	Price per kilo of live young rabbits	300 pts
P2	Price per kilo of culled rabbits	60 pts
P3	Price of bucks and does (per unity)	2000 pts
P4	Price per kilo of food	30 pts
	Pregnancy and lactation	
L	Days of lactation	35 days
G	Days of pregnancy	30 days
	Weights	
MBW	Live weight at maturity	3.5 kg
WS	Live weight at slaughter time	1.85 kg
BW	Weight at birth	0.05 kg
WW	Weigh at weaning	0.5 kg
	Feed consumption	
FMM	Maintenance requirements of a male during its reproductive life	60.8 kg
CRep	Feed consumption of rabbits for replacement from 2 to 4 months of age	12 kg
PRM	Maintenance requirements during pregnancy	160 g/d
LRM	Maintenance requirements during lactation	190 g/d
ERRG	Extra-requirements for each gestated rabbit	5 g/d
ERRL	Extra-requirements during lactation	25 g/d
DCL	Daily consumption per young rabbit during lactation	10.3 g/d
DCF	Daily consumption per young rabbit during fattening period	135 g/d
	Daily gain	
DGL	Daily gain during lactation	12.8 g/d
DGF	Daily gain during the fattening period	48.2 g/d
	Reproductive variables	
LS	Litter size	9.52
DY	Number of parities per year	7.3
RR	Replacement rate of the farm (per unit and year)	1.2
	Others	
HC	Health costs per adult rabbit	730 pts
NM	Proportion of slaughtered adult rabbits not commercialized	0.35
(constant)	Ratio bucks/does	1/7

TABLE 2. Variables related to fixed costs and their values in pts/cage

	LABOUR	ENERGY + WATER	FARM BUILDING DEPRECIATION
FFC = MFC	3400	392	864
FCRep	680	64	115
FCF	18.6	8.25	6.9

FFC: Females fixed costs

MFC: Males fixed costs

FCRep: Fixed costs for replacement

FCF: Fixed costs at fattening

TABLE 3. Profit function

RETURNS per doe and year

Returns from fattened rabbits

$$RFR = LS \cdot DY \cdot (1-WM) \cdot (1-FM) \cdot WS \cdot P1$$

Returns from culled rabbits

$$RCR = (RR-NM) \cdot MBW \cdot P2 \cdot \left(1+\frac{1}{7}\right)$$

Total Returns R = RFR + RCR

TABLE 3. (Cont.)

COSTS per doe and year

Costs assigned to the doe

Male costs

$$MRC = \frac{1}{7}\left[(FMM \cdot P4) + HC\right] \cdot RR + \frac{1}{7} MFC$$

Replacement costs

$$RepC = \left[\frac{P3}{1-MM} + (CRep \cdot P4) + FCRep\right] \cdot RR \left(1 + \frac{1}{7}\right)$$

Food costs

$$FC = DY \cdot \left(\frac{365}{DY} - L\right)\left[PRM + (ERRG \cdot LS)\right] \cdot P4 +$$
$$+ DY \cdot \left(\frac{365}{DY} - G\right)\left[LRM + (ERRL \cdot LS)\left(1 - \frac{WM}{2}\right)\right] \cdot P4 +$$
$$+ DY \cdot \left(G + L - \frac{365}{DY}\right)\left[LRM + (ERRG \cdot LS) + (ERRL \cdot LS)\left(1 - \frac{WM}{2}\right)\right] \cdot P4$$

Other costs of the doe

$$GC = FFC + (HC \cdot RR)$$

Total costs of does MC = GC + MRC + RepC + FC

Costs of the fattening rabbit

Feed cost during lactation

$$LC = LS \cdot DY \cdot (1-WM) \cdot DCL \cdot \frac{WW-BW}{DGL} \cdot P4$$

Costs from weaning to slaughter time

$$WSC = \left(LS \cdot DY \cdot (1-WM) \cdot \frac{1-FM}{2}\right) \cdot \left(FCF + DCF \cdot \frac{WS-WW}{DGF} \cdot P4\right)$$

Total costs of the fattening rabbits DC = LC + WSC

Total costs C = MC + DC

PROFIT FUNCTION: PROFIT = R - C

TABLE 4. Economic weights

Trait	pts	USA $	ECU
EWLS	2130.5	21.3	16.9
EWDY	2751.2	25.5	21.83
EWCR	-237.8	-2.4	1.89
EWRR	-56.9	-0.57	-0.45
EWWM	-247.5	-2.5	-1.96
EWFM	-290.1	-2.9	-2.3
EWDGL	47.8	0.5	0.38
EWDGF	187.9	1.9	1.5
EWDCL	-63.8	-0.6	-0.5
EWDCF	-49.5	-0.5	-0.4

EWLS: Economic weight for an increase of litter size of one rabbit.

EWDY: Economic weight for an increase of one delivery per year.

EWRR: Economic weight for an increase of the replacement rate of 1%

EWCR: Economic weight for increasing 0.1 the food conversion rate from weaning to slaughtering.

EWWM: Economic weight for increasing mortality at weaning 1%

EWFM: Economic weight for increasing mortality at fattening 1%

EWDGL: Economic weight for increasing the daily gain at lactation 1 gr.

EWDGF: Economic weight for increasing the daily gain at fattening 1 gr.

EWDCL: Economic weight for increasing 1 gr the daily food consumption at lactation.

EWDCF: Economic weight for increasing 1 gr the daily food consumption at fattening.