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# Selection scheme of two lines of meat rabbits and their performance level after two years of selection

**L. MAERTENS**

MINISTRY OF AGRICULTURE, GOVERNMENT AGRICULTURAL  
RESEARCH CENTRE GENT, RESEARCH STATION FOR SMALL  
STOCK HUSBANDRY, BURG. VAN GANSBERGHELAAN 92,  
9820 MERELBEKE, BELGIUM.

**SUMMARY** - A description is given of a selection scheme to provide homogeneous and productive meat rabbits for experimental purposes. As a terminal cross, does from the dam line selected for reproductive traits, are combined with males from the sire line selected for DWG and FCR. Selection criteria during the test period in the dam line (first 3 litters) are initial litter size, weaned young and milk index. To increase the prediction of the breeding value, cross fostering of kits is performed to standardise litter size to 8 or 9 kits. Traits of both lines are given after 2 years of selection. Traits of the test and nucleus does were: 8.51 and 10.67 litter size at birth, 7.91 and 7.98 at weaning, 2651 and 2896 g milk index, respectively. The offspring of the first generation of the sire line had an average DWG of 44.5 g and FCR of 2.91 between 28 and 70 d. An increase of DWG of 7 to 9% was obtained in the next 2 generations. However FCR increased by 4%, but during the second year FCR decreased. Reproduction problems with this line are mentioned.

**Key words:** rabbits, selection scheme, lines, Institute stock, performance level

**RESUME** - "Schéma de sélection de deux lignées de lapins de chair, et niveau de performances après deux années de sélection." On décrit le schéma de sélection pour obtenir des lapins de chair homogènes et productifs pour des essais expérimentaux. Comme croisement terminal, des lapines de la lignée femelle, sélectionnées pour les caractères de reproduction, sont saillies par des mâles de la lignée paternelle, sélectionnés pour la croissance et l'indice de consommation. Les critères de sélection pendant la période de testage (3 premières nichées) sont la prolificité, la production laitière et le nombre de lapereaux sevrés. Pour obtenir une meilleure estimation de la valeur génétique, toutes les portées sont standardisées à 8 ou 9 lapereaux à la mise bas. Après deux ans de sélection on donne les premiers résultats des deux lignées. Les femelles en testage et le noyau ont en moyenne, respectivement, une prolificité de 8,51 et 10,67 à la naissance et 7,91 et 7,98 au sevrage et un indice de lactation de 2651 et 2896 g. Les descendants de la première génération de la lignée mâle avaient en moyenne une croissance journalière de 44,5 g et un indice de consommation de 2,91 entre l'âge de 28 et 70 jours. Une progression de la croissance de 7 - 9% a été obtenue dans les 2 générations suivantes. L'indice de consommation était moins favorable de 4%, mais pendant la deuxième année une amélioration de l'indice était obtenue. Des problèmes de reproduction avec la lignée mâle sont mentionnés.

**Mots-clés:** Lapin, schéma de sélection, lignées, population de l'Institut, niveau de performances

## Introduction

The importance of a homogeneous strain for experimental purposes has been stressed by Lebas (1986). Furthermore, rabbits are very sensitive to diseases and treatment is difficult and even sometimes impossible (Devrieze et al., 1987). Due to sanitary problems, time consuming and expensive trials can fail. Therefore the main objective of the selection unit at our Research

Institute is to provide homogeneous, healthy and highly productive rabbits for the nutrition and reproduction experiments. A secondary objective is to provide genetic stock to breeders. Because of practical and sanitary limitations only a small number of young males or sperm are available.

As in other animal productions, crossbreeding of specialized breeds or strains is also performed for rabbit meat production, making use of the complementarity

between dam lines, having a good reproduction ability and sire lines with excellent meat production characteristics. Based on this principle, our selection unit was reorganized at the end of 1987. Two closed lines were constituted, to provide a terminal cross of does from one line with males of the second line.

In this paper a description is given of the selection scheme adapted to our objectives, taking into account our limited facilities. After 2 years of selection some preliminary traits of the two strains are given.

## Material and methods

### ANIMAL MATERIAL

The initial stock, consisting of New Zealand White, crosses with White of Termonde and Elco hybrids, was used to set up the selection program. Formerly does were selected following the mass principle. Computer data of all relevant production parameters were used to calculate a multiplicative index as a predictor of their breeding value. These data were used to select the initial stock of the two lines.

Does with performances above the population average for litter size and milk production (21 d litter weight) were used as nucleus of the dam line. They had at least 4 litters produced. From the end of 1987 they were mated with males descending from "top" does. This initial nucleus of the dam line consisted of 30 does.

The sire line was constituted of female progeny of does with the best progeny results of growth rate and gross feed efficiency in their successive litters. Twenty young does were selected as nucleus and mated with Elco hybrid males which had proven their meat production capacities (Okerman et al., 1987).

### HOUSING AND REPRODUCTION RHYTHM

The two lines are housed in the same rabbitry, but in different compartments. For the dam line about 100 doe cages are available and 40 wait-gestation cages next to the fattening unit. Does of both lines are mated semi-intensively (10 d PP). Thirty doe cages are available for the sire line. Kits are weaned at 4 weeks and 4/litter are transferred to one of the 150 individual cages.

### SELECTION SCHEME OF THE DAM LINE

Only young does descending from the nucleus herd are tested during their first three litters. They are allowed to the nucleus when they obtain at least the following performances during the test period:

\* 24 kits born alive (from 1989 on, 27 kits)

\* 22 kits weaned (from 1989 on, 24 kits)

\* an average milk index of 3.0 kg for litter 2 and 3

Furthermore secondary characteristics are taken into account: 2 times consecutively not pregnant or signs of score hocks are also reasons to eliminate young does.

To increase the prediction of the breeding value during the test period, all litters are standardised to 8 kits at parturition (from 1989 on, 9) by cross fostering.

Young males, descending from "top" does, are used only on test does. After about one year a selection is done based partially on their progeny and secondary on their live weight (<4.5 kg) and their wire mesh resistance.

### SELECTION SCHEME OF THE SIRE LINE

Individual performance of all progeny is measured between 28 and 70 days: daily weight gain minus gross feed efficiency only on 4 young/litter. The renewal of the nucleus was initially based on the following selection criteria:

does:	the average of the litter	> population average
	daily weight gain (DWG)	> 45g
	feed conversion (FCR)	< 2.75
males:	daily weight gain	> 50g
	feed conversion	< 2.70

Based on the results, criteria for daily weight gain were progressively increased.

## Results and discussion

### DAM LINE

In table 1 the average performances of test does and nucleus does of the dam line are given. Data are recorded between September and December 1989, after running two years the selection scheme. The initial nucleus does were already totally replaced by positive tested young does.

Litter size amounted to 8.51 and 10.67, respectively. This difference can totally be ascribed to the much smaller size of the first litters. It is well known that the traits of primiparous does are lower (Rouvier et al., 1973), but the difference in our strain reached nearly 30% for litter size at birth and about 20% for milk production. Early mating could be the explanation, although their weight was about 80% of adult weight (Table 1).

**Table I**  
**Traits of the dam line (period Sept. — Dec. 1989).**

Litter size					Milk index (g)	Weight of the doe at mating (g)
	alive	allowed kits	at 3 weeks	at weaning		
Test does						
Litter 1	7.22	8.21	7.68	7.52	2355	3440
Litter 2	9.75	8.71	7.53	8.41	3006	4022
Litter 3	10.17	8.73	8.42	8.31	2974	4218
Mean (n=147)	8.51	8.45	8.03	7.91	2651	3762
± s	2.96	1.33	2.07	2.15	527	466
Nucleus does						
Mean (n=52)	10.67	8.70	8.02	7.98	2896	4293
± s	2.24	.78	1.21	1.21	415	340

Not always enough kits were available to standardise litter size to 9. Therefore the allowed number was somewhat lower. On average 7.91 kits were weaned/weaned litter or 93.6% of the allowed number. The milk index amounted on average to nearly 3 kg in the 2nd and 3rd lactation, which was one of the goals of the selection program.

Traits of the nucleus does, composed of positive tested does from their 4th litter on, were 10.67; 7.98; 2.896 kg for, respectively, litter size at birth, at weaning and milk index. Litter size of these does was always decreased to 9 kits, while smaller litters were not completed to be sure of the youngs' identity.

Although an exact comparison cannot be made, traits of these does were of the same order as those of the hybrid strains tested at our Institute five years ago (Maertens et al., 1986). Compared to the former selection stock increased performances were obtained for all selected traits (see Maertens et al., 1986).

## SIRE LINE

In 1988 most of the offspring belonged to the 1st generation. DWG and FCR amounted to 44.5 g and 2.91, respectively (Table 2). An increase in DWG of 7

**Table II:**  
**Performances of progeny of the sire line**

Generation	Year	No of animals	Litter size*	Weight at 28d	Finishing weight at 70d	Daily weight gain (g)	Feed** conversion
1	1988	398	7.80	570 (=100)	2439 (=100)	44.5 (=100) ± 2.5	2.91 (=100) ± 0.23
	1989	108	7.71	602 (106)	2479 (102)	44.7 (100) ± 2.0	2.92 (100) ± 0.21
2	1988	113	7.53	580 (102)	2575 (106)	47.5 (107) ± 1.8	3.02 (104) ± 0.21
	1989	329	7.48	634 (111)	2651 (109)	48.0 (108) ± 2.3	2.95 (101) ± 0.20
3	1988	-	-	-	-	-	-
	1989	235	6.71	619 (109)	2656 (109)	48.5 (109) ± 2.8	2.85 (98) ± 0.17

\* average litter size at weaning

\*\* kg feed/kg weight gain

to 8% was measured in the second generation but FCR was worse (4%). From 1989 on FCR improved till reaching the same level of the first generation. The worsened FCR can be explained by the higher finishing weight, which was about 130 to 170 g higher for the offspring of the second generation. The better FCR from 1989 on can partly be explained by the use of our own tested males.

After 2 years of selection on DWG and FCR in this strain, does showed lower receptivity to the male and especially their ability to live on a wire mesh bottom decreased. These problems could partly be related to the increased adult weight (> 5 kg). A fall of the reproduction and fitness response in DWG selected strains was also observed elsewhere (see review Rochambeau de, 1988).

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