EVALUATION OF THE FATTENING PERFORMANCE OF F1 CROSSBREDS FROM ȚIGAIE EWES AND FRENCH MEAT BREED RAMS

C. Pascal[1*], C. Pânzaru[1], D. Bulmagă[2], C. Cristian[2]

[1]*"Ion Ionescu de la Brad" Iași University of Life Sciences, Romania*
[2]*Research and Development Station for Sheep and Goat Breeding, Bacău, Romania*

Abstract

The research conducted represents the initial stage of a systematic process aimed at organizing sheep meat production based on the application of appropriate management practices. The ultimate goal of the study was to examine the response of crossbred lambs subjected to intensive fattening technology. These F1 crossbreds were obtained from systematic matings between rams of French meat breeds and local Țigaie ewes, rusty variety. The biological material used in the study consisted of first-generation (F1) crossbred lambs obtained by mating local Țigaie ewes, reared and maintained at the Research and Development Station for Sheep and Goat Breeding in Secuieni-Bacău, with rams from French meat breeds, as Vendeen and Blanche du Massif Central. Lambs were weaned after 90 days of suckling, and the applied fattening technology included three technological phases for 70 days: adaptation (10 days), growth and fattening (50 days), and finishing (10 days). The collected data were statistically processed, centralized, and appropriately interpreted. For data analysis, the REML (REstricted Maximum Likelihood) procedure was applied, ensuring reliable estimates within the normal parameter space. The final live body weight recorded at the end of the fattening period showed superior performance, with increases of 26.74% in V × Ti, 27.17% in BMC × Ti, and 21.94% in Bc × Ti crossbreds. The weight differences between the control and crossbred groups at the end of this phase were highly significant, being statistically validated at p ≤ 0.001.

Key words: meat, lambs, breeding, Tigaie sheep, fattening

INTRODUCTION

The objective of this research was to conduct a thorough analysis of the traits that determine meat production in first-generation (F1) crossbred lambs. The data obtained are of particular importance and align with national and international trends. In 2024, Romania recorded a higher meat output compared to previous periods. Meat production increased in March 2024 across all livestock and poultry species compared to the previous month; however, in sheep and goats, production nearly tripled (+179%) [1]. According to the same source, sheep and goat meat production rose by approximately 179% in March 2024, reaching 4,699 tons compared to 1,686 tons in February 2024, and by 29.38% compared to March 2023. Based on INS data, 364,000 sheep and goats were slaughtered in March 2024, almost three times more than in the previous month (110,000 head). In March 2024, the total number of slaughtered sheep and goats reached 276,000 head [2].

Sheep meat production largely depends on factors influencing the specific traits associated with this type of production. These traits are inherited from the parents but are also strongly influenced by environmental conditions. In sheep, such traits include:

- growth traits, e.g., growth rate, body size, body volume, and muscle mass development;

- carcass traits, e.g., loin eye area, fat tissue deposition, and carcass dimensions;
- health traits, e.g., susceptibility to transmissible diseases;
- wool traits, e.g., fleece weight, fiber diameter, wool length;
- reproductive traits, e.g., number of lambs born and weaned.

The organization of meat production based on sound economic principles represents a continuous and sustained activity focused on the systematic production of hybrid lambs intended exclusively for fattening. Regardless of ownership structure, lambs obtained during the lambing season are subject to evaluation to determine their future purpose. Their development pathway is divided into two directions: those retained for breeding, aimed at replacing culled adult sheep, and those destined for meat production. In specialized farms focusing on hybrid lamb production, this bifurcation does not apply, as all lambs are destined for fattening and are marketed exclusively for meat production after weaning.

RESULTS

The biological material used in this research consisted of first-generation (F1) crossbred lambs obtained by mating local Țigaie ewes, maintained and exploited at the Research and Development Station for Sheep and Goat Breeding, Secuieni-Bacău, with rams from French meat breeds, precisely Vendeen and Blanche du Massif Central. Following the matings performed in the autumn of 2023, the first crossbred lamb generations were obtained. After weaning, these animals were subjected to fattening technologies in order to evaluate traits related to meat production both in live animals and on carcasses after slaughter.

The applied methods were specific to and adapted for this type of scientific research, while the experimental conditions and treatments will be further detailed in subsequent stages of the study. To achieve the objectives of the current phase, the first-generation lambs were directed towards fattening, whereas the crossbred females were retained for the establishment of a future breeding nucleus, with the aim of obtaining specialized hybrids for meat production. All experimental groups were managed under identical conditions of housing, welfare, and feeding. During the suckling period, ewe-lamb pairs benefited from comparable conditions. Weaning was carried out at 90 days of age, after which the experimental groups, consisting of crossbred males, were subjected to an intensive fattening technology. This strategy was chosen by the research team to assess the response of young crossbreds to short-term fattening, thereby ensuring efficient use of available resources.

Throughout the fattening period, lambs were weighed at the beginning and end of each stage. The results obtained were used to calculate the total average growth gain per stage and the average daily gain. The applied fattening technology comprised three distinct stages with a total duration of 70 days, namely an adaptation stage (10 days), a growth and fattening stage (50 days), and a finishing stage (10 days). The collected data were statistically processed, centralized, and properly interpreted. For data analysis, the REML (REstricted Maximum Likelihood) procedure was applied, ensuring the estimation of parameters within the normal parameter space.

DISCUSSIONS

The traits that determine meat production across all breeds within any livestock species, whether specialized or dual-purpose, must be continuously improved. In sheep, as in cattle, the primary issues are largely similar, since clear distinctions can be made between breeds specialized for meat production, those oriented toward other outputs (such as milk, pelts, wool, or hides), and breeds with

mixed production. The foundation of animal amelioration, regardless of species, lies in selection and the careful choice of breeding stock, coupled with the judicious planning of matings. These practices must be correlated with the guided rearing of young animals and the provision of optimal living conditions. The main tools for predicting and pre-determining valuable traits in the offspring are represented primarily by knowledge of the breeding value of rams and dams and by their appropriate pairing in the framework of controlled mating programs.

Depending on the purpose pursued, the pre-determination of valuable traits in the offspring may aim either at consolidating specific qualities characteristic of the parental lines or at modifying these traits in a positive (or sometimes negative) direction. In practice, the consolidation of valuable characteristics is most often achieved through directed matings, whereas the modification of traits relative to the average values of the parental populations is generally pursued through heterogeneous matings. In accordance with the experimental design, crossbreeding between Țigaie ewes and rams of French meat breeds produced the first generation of F1 crossbred lambs. Following the birth of these F1 lambs, testing of their performance for meat production was initiated under a specific fattening system.

The fattening of the crossbred lambs, obtained through the crossing of local ewes with French meat breed rams, was carried out under identical growth and feeding conditions. The fattening period began immediately after weaning and extended over 70 days. Since the purpose of the applied fattening technology was to evaluate fattening capacity, with an emphasis on the efficient utilization of feed resources typical of plain, hill, and sub-mountain areas, the fattening of the male groups was conducted in confinement and involved three successive technological phases: an adaptation stage of 10 days, a fattening stage of 50 days, and a finishing stage of 10 days.

The fattening system was based on intensive practices, as the research team aimed to assess the response of crossbred lambs to technological strategies designed to shorten the time required to achieve optimal live weights for slaughter. Therefore, fattening was carried out exclusively under confinement conditions and included several distinct phases. Each phase was established in such a way as to optimize essential technological aspects and to allow individuals to fully express their productive potential.

The adaptation phase followed the weaning of lambs and marked the transition from the suckling period to the actual fattening period. Under the practical conditions specific to Romania, the duration of this stage is variable, depending on the fattening system adopted and influenced by several factors. In countries with a tradition in lamb meat production, the weaning age is usually postponed, often exceeding 100 days. For example, Haresing, cited by Sandu [3], reports that in England lambs are weaned at ages above four months or when the young naturally detach themselves from the dam.

Regarding the length period of the adaptation phase, studies conducted both in Romania and in other European countries indicate that this period should last approximately 10 days, in order to provide lambs with sufficient time to adjust to the new housing system and feeding regime. In all F1 crossbred groups, as well as in the purebred Țigaie group, weaning age was set at 90 days.

The crossbred lambs were grouped and then subjected to an intensive fattening system. To enable performance comparisons, a control group consisting of purebred Țigaie lambs from the same farm and lambing season was also included. Body weight at weaning corresponded to

the initial weight at the beginning of the adaptation phase. Notably, relatively high live weights were recorded in the crossbred lambs at the start of the adaptation stage (Table 1). Data analysis highlights that the live weight of the crossbred lambs was considerably higher. Achieving live weights exceeding 34 kg in all three crossbred groups reflects a high degree of precocity and an enhanced propensity for feed efficiency and muscle deposition.

When compared with the purebred Țigaie lambs, the crossbreds with Vendeen, Blanche du Massif Central, and Berrichon du Cher rams exhibited initial body weights at the onset of fattening that were higher by 30.70%, 30.93%, and 26.81%, respectively. Similarly, at the end of the adaptation phase, body mass was still greater in the crossbreds: +29.57% in Vendeen × Țigaie, +30.15% in Blanche du Massif Central × Țigaie, and +25.36% in Berrichon du Cher × Țigaie lambs compared to the purebred Țigaie controls. The values obtained for total gains during this phase showed that while the Țigaie lambs registered an average cumulative gain of 1.89 ± 0.44 kg, both Vendeen × Țigaie and Blanche du Massif Central × Țigaie crossbreds exceeded 2 kg.

Table 1 Evolution of live weight during the adaptation phase (kg)

Specification	n	Initial weight		Final weight		Total weight gain	
		$\overline{X} \pm s\,\overline{X}$	V%	$\overline{X} \pm s\,\overline{X}$	V%	$\overline{X} \pm s\,\overline{X}$	V%
Ti	40	25.21^a±0.14	8.41	27.10^a±0.24	9.25	1.89±0.44	7.12
V x Ti	15	36.38^d± 0.02	9.20	38.48^d±0.22	7.22	2.10±0.08	9.14
BMC x Ti	16	36.50^d±0. 42	9.31	38.80^d±0.41	10.01	2.30±0.45	7.07
BC x Ti	20	34.47^d ±0.32	7.28	36.31^d±0.16	8.52	1.84±0.28	6.12

Note: *V = Vandeen, BMC = Blanche du Masif Central, BC = Berrichon du Cher; Ti=Țigaie rusty variety a,d very significant p < 0.001.*

The fattening phase proper was the longest, with a total length of 50 days, during which the highest weight gains were recorded across all experimental groups. The body weight increments were directly influenced by the degree of precocity and the aptitude for meat production. The body weights recorded at the end of this phase for all groups, together with the statistical significance of the observed differences, are presented in Table 2. The data indicate substantial increases in live weight at the end of the second phase, with the minimum recorded value in the crossbred groups being 45.12 ± 0.31 kg in BC × Ti, 48.68 ± 0.31 kg in V × Ti, and 49.51 ± 0.61 kg in BMC × Ti. Expressed in absolute terms, the differences in body weight were considerable in magnitude and statistically highly significant ($p \leq 0.001$) in all crossbred groups compared with the performance of purebred Țigaie lambs.

The total gains recorded during the second phase exceeded 10 kg in both BMC × Ti and V × Ti groups. It is noteworthy that the cumulative gain during this phase in the BC × Ti group was comparable to that achieved by the purebred rusty Țigaie lambs. This outcome was the main reason why the research team adjusted the fattening protocol, reducing the overall duration from the initially planned 85 days to 70 days.

The finishing phase concluded the fattening technology and lasted only 10 days. During this period, the protein content of the diet was increased by 15% in order to improve the organoleptic qualities of the muscle tissue by enhancing fat deposition both between muscle bundles and within muscle fibers. Under these conditions, the total weight gains recorded in the F1 crossbred groups ranged between 2.05 ± 0.55 kg in BMC × Ti and 2.98 ± 0.41 kg in BC × Ti. Compared with the Țigaie group,

the crossbreds obtained with Vandeen rams exhibited a 26.75% higher live weight.

The final live weight recorded at the end of this phase corresponded to the conclusion of the fattening process. Data analysis revealed that all crossbred groups achieved superior values, markedly surpassing the performance of purebred Țigaie lambs.

Table 2 Live weight evolution during the fattening phase (kg)

Specification	n	Initial weight		Final weight		Total weight gain	
		$\overline{X} \pm s\overline{x}$	V%	$\overline{X} \pm s\overline{x}$	V%	$\overline{X} \pm s\overline{x}$	V%
Ti	32	27.10±0.24[a]	9.25	35.85±0.42[a]	8.81	8.75±4.12	9.04
V x Ti	12	38.48±0.22[d]	7.22	48.68±0.31[d]	9.12	10.21±0.33	7.14
BMC x Ti	13	38.80±0.41[d]	10.01	49.51±0.61[d]	3.35	10.71±0.51	7.12
BC x Ti	18	36.31±0.16[d]	8.52	45.12±0.31[d]	5.14	8.81±.12	7.51

Note: V = Vandeen, BMC = Blanche du Masif Central, BC = Berrichon du Cher; Ti=Țigaie rusty variety
[a,d] highly significant for p ≤ 0.001

Table 3 Live weight evolution during the finishing phase (kg)

Specification	n	Initial weight		Final weight		Total weight gain	
		$\overline{X} \pm s\overline{x}$	V%	$\overline{X} \pm s\overline{x}$	V%	$\overline{X} \pm s\overline{x}$	V%
Ti	32	35.85±0.42	8.81	37.55[a]±0.55	8.15	1.75±0.12	5.55
V x Ti	12	48.68±0.31	9.12	51.26[d]±0.44	8.09	2.58±0.87	9.14
BMC x Ti	13	49.51±0.61	3.35	51.56[d]±0.44	6.31	2.05±0.55	6.05
BC x Ti	18	45.12±0.31	5.14	48.11[d]±0.38	5.44	2.98±0.41	8.22

Note: V = Vandeen, BMC = Blanche du Masif Central, BC = Berrichon du Cher; Ti=Țigaie rusty variety
[a,d] highly significant for p ≤ 0.001

Analysis of live body weight recorded during the fattening period. Based on the response of crossbred lambs to the applied technology for testing meat production aptitude, the fattening process was completed after only 70 days, at which point the average age was 160 days. Statistical processing of the data indicates highly significant differences ($p \leq 0.001$) between the performances achieved by crossbred lambs and those of the Țigaie breed.

The analysis of differences between the experimental groups shows higher absolute values in the crossbred groups, a result primarily due to the precocity of the paternal breeds. The live body weight recorded at the end of the fattening period demonstrates superior performances by 26.74% in V x Ti, by 27.17% in BMC x Ti, and by 21.94% in Bc x Ti, a trend clearly illustrated in Figure 1. The intense rate of muscle mass accumulation during the fattening period is largely attributable to the precocity of the breeds used in obtaining the crossbred lambs.

To highlight the role of precocity in improving crossbred performance for meat production, the data obtained in this study exceed other values reported in the national scientific literature. Supporting this aspect, studies conducted by Pascal C. (1997) indicated that the highest live weights in crossbred groups, compared with Merinos de Palas purebred lambs, were recorded in the Texel x Merinos de Palas group, followed by the Ile de France x Merinos de

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Palas group, which achieved superior growth rates of 17.27% and 11.37%, respectively, compared with the maternal breed.

The total weight gain accumulated during fattening was 12.34 ± 0.44 kg in Ţigaie lambs. In comparison, the V x Ti crossbred group achieved an average total weight gain of 14.88 ± 0.31 kg, the BMC x Ti group reached 15.06 ± 0.51 kg, and the BC x Ti group recorded a slightly lower level of only 13.64 ± 0.66 kg. The differences between groups are illustrated in Figure 2.

Table 4 Live weight evolution throughout the entire fattening period (kg)

Specification	n	Initial weight		Final weight		Total weight gain	
		$\overline{X} \pm s\overline{x}$	V%	$\overline{X} \pm s\overline{x}$	V%	$\overline{X} \pm s\overline{x}$	V%
Ti	32	25.21±0.14	8.41	37.55[a]±0.55	8.15	12.34±0.44	7.51
V x Ti	12	36.38± 0.02	9.20	51.26[d]±0.44	8.09	14.88±0.31	6.12
BMC x Ti	13	36.50±0. 42	9.31	51.56[d]±0.44	6.31	15.06±0.51	5.48
BC x Ti	18	34.47 ±0.32	7.28	48.11[d]±0.38	5.44	13.64±0.66	8.02

Note: *V = Vandeen, BMC = Blanche du Masif Central, BC = Berrichon du Cher; Ti=Ţigaie rusty variety* [a,d] *highly significant for p ≤ 0.001.*
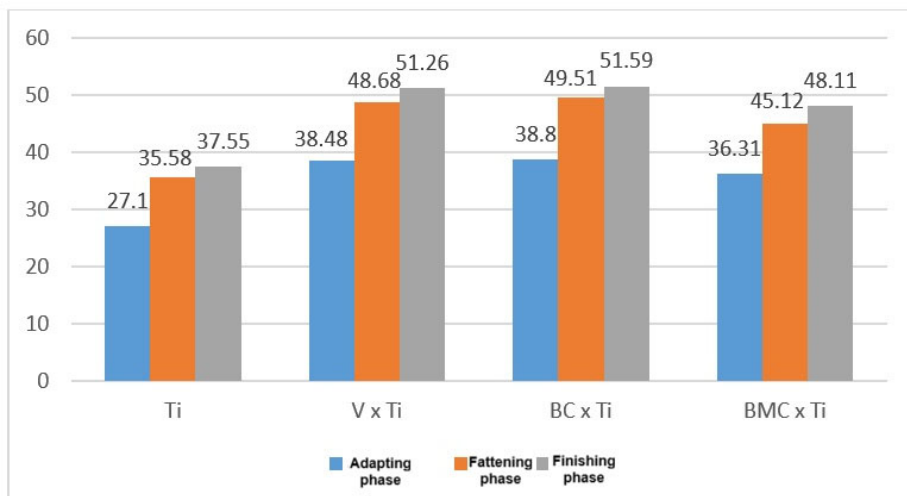

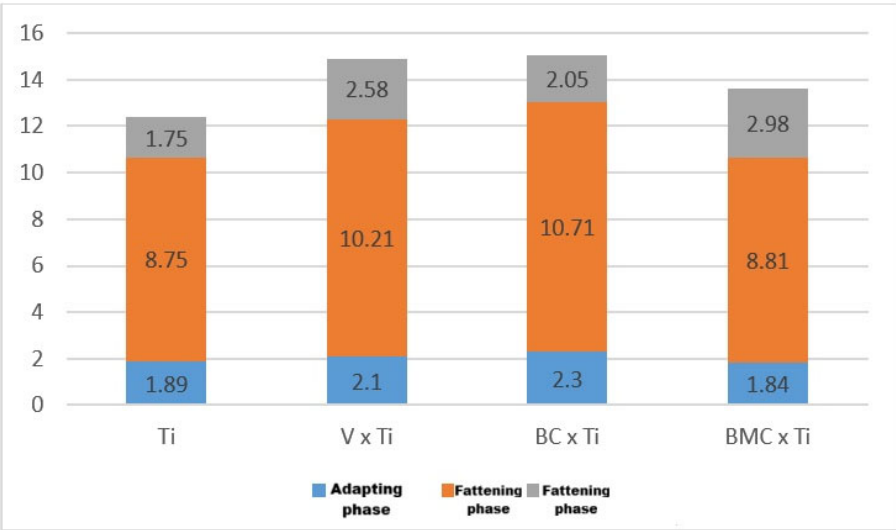Fig. 1 Dynamics of live body weight evolution across fattening phases (kg)

Fig. 2 Average growth gain accumulation across fattening phases (kg)

Analyzing the data obtained at the end of the finishing period, it can be observed that through industrial crossbreeding with rams from meat breeds of French origin, one of their specific characteristics, also highlighted by other authors [4–8], namely the ability to reach high body weights at an early age (precocity), is relatively well expressed in the three crossbred groups. It is also worth noting the dynamics of body weight in Tigaie lambs which, although generally considered a semi-late breed with modest aptitude for meat production, once again demonstrate that when provided with favorable fattening and feeding conditions, they respond positively and achieve superior values. Between the control groups and the crossbreds, the differences in body weight recorded at the end of this phase were highly significant, being statistically ensured for $p \leq 0.001$.

CONCLUSIONS

The applied finishing technology was based on intensification elements, as the research team aimed to evaluate the response of crossbred lambs to specific technological aspects that could potentially

reduce the time required to reach optimal live weights for slaughter.

Achieving higher live weights, exceeding 34 kg in all three crossbred groups, indicates very good precocity and a greater aptitude for nutrient assimilation and muscle deposition. Compared to the local Tigaie lambs, crossbreds with Vandeen, Blanche du Massif Central, and Berrichon du Cher rams had higher initial live weights at the start of the finishing period by 30.70%, 30.93%, and 26.81%, respectively.

At the end of the finishing phase, the average live body weight in the crossbred groups was 45.12 ± 0.31 kg for the BC x Ti group, 48.68 ± 0.31 kg for the V x Ti group, and 49.51 ± 0.61 kg for the BMC x Ti group. The live body weight recorded at the end of the finishing period demonstrates superior performances of 26.74% in the V x Ti group, 27.17% in the BMC x Ti group, and 21.94% in the BC x Ti group.

The total average weight gain accumulated during the finishing period was 12.34 ± 0.44 kg for Tigaie lambs. In comparison, the V x Ti crossbred group achieved a total average weight gain of

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14.88 ± 0.31 kg, the BMC x Ti group 15.06 ± 0.51 kg, and the BC x Ti group 13.64 ± 0.66 kg. Differences in live weight recorded at the end of the finishing period between the control and crossbred groups were highly significant ($p \leq 0.001$).

ACKNOWLEDGMENTS

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