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Survival and growth performance of local chickens from Burkina Faso and their crossbreeds with exotic cocks in an intensive production system

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Abstract

In response to the growing demand for poultry products in Burkina Faso, small scale producers near urban centres have increasingly adopted crossbreeding practices, mating indigenous hens with exotic roosters. Despite this trend, limited information exist on the performance of these crossbreeds under intensive production systems. This study evaluated the growth and survival performance of local chickens and their crossbreeds to assess the current crossbreeding practices. Four experimental groups of chickens were established, comprising 54, 40, 38, and 36 individuals respectively, resulting from matings between local hens and cocks of the North Holland Blue, Sasso, Brahma, and local breeds. Birds were reared over a 20 week period, with growth and survival data analysed using descriptive statistics and Gompertz growth modelling. At 20 weeks, the average live weights were 1,297 g for Brahma crossbreeds, 1,261 g for North Holland Blue crossbreeds, 1,572 g for Sasso crossbreeds and 1,083 g for the local breed. The crossbreeds all significantly outperformed the local breed ($p < 0.05$). The Sasso crossbreeds exhibited superior growth throughout the rearing period, while the Brahma and North Holland Blue crossbreeds only surpassed the local breed after the fourth month. The Sasso crossbreeds also displayed the most favourable Gompertz parameters: mature weight (a) of 2,027 g, maturation rate (k) of 0.02, and integration constant (b) of 4.3. However, they also recorded the highest mortality rate (25 %), contrasting with the lowest rate observed in the local breed (8.3 %), a statistically significant difference ($p < 0.05$). These findings suggest that while Sasso crossbreeding offers promising gains in meat production, targeted improvements in management practices are essential to mitigate associated mortality risks and ensure sustainable adoption in smallholder systems.

Keywords: average daily gain, crossbreeding, Gompertz parameters, live weight, native chicken

1 Introduction

Demographic growth, increasing urbanisation, and rising income, particularly in developing countries, have driven a growing demand for animal products (FAO, 2011). This surge has been especially pronounced for poultry products, with demand projected to continue increasing through 2050 (Mottet & Tempio, 2017). These trends present significant opportunities that both traditional and emerging farmers have sought to capitalise on by establishing farms near urban centres (Ayantunde *et al*., 2014; Sariyev & Zeller, 2023). In Burkina Faso, this dynamic has been particularly evident over the past few decades in the suburban areas of major cities, where various livestock enterprises, including poultry farming, have emerged (Amadou *et al*., 2012; Tindano *et al*., 2015). Among these are small-scale chicken producers focused primarily on meat production. Typically, these producers lack the financial resources, technical expertise, and/or time required to manage commercial strains effectively (Tindano & Savadogo, 2025). As a result, they often rely on local breeds. Local chickens are well-known for their adaptability to harsh environmental conditions and their resilience to disease (Desta, 2021), making them less demanding in terms of investment and management. Addi-

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tionally, their meat is often preferred by consumers due to its distinctive flavour (Desta, 2021).

However, despite these advantages, local breeds suffer from poor performance in key areas such as growth rate, feed efficiency, and egg production, even under optimal management conditions (Alders *et al*., 2018; Mancinelli *et al*., 2023). These limitations make them unsuitable for intensive production systems (Alders *et al*., 2018; Desta, 2021). Yet, the pressures of limited space and the pursuit of profitability in urban and suburban settings necessitate more intensive production practices (van Berkum, 2023). This presents a challenge for small-scale producers, many of whom in our study area attempt to address it by crossbreeding local chickens with exotic breeds. The goal is to develop birds that retain the hardiness of local chickens while exhibiting superior productivity, thereby making intensive farming more viable.

Several exotic breeds are used in such crossbreeding efforts, including the North Holland Blue, Sasso, and Brahma (Tindano & Savadogo, 2025). This practice raises several key questions:

- Do crossbreeds outperform local chickens in terms of growth?
- Which crossbreed demonstrates the best performance?
- Does crossbreeding improve survival rates?

Previous studies have evaluated the performance of crossbreed chicks resulting from mating between local chickens and exotic breeds such as Sasso and Isa Brown (Ouedraogo *et al*., 2015; Bilalissi *et al*., 2022). However, these studies did not compare the crossbreds with local breeds under identical conditions. The present study aimed to assess and compare the growth and survival performance of local and crossbreed chickens under conditions similar to those experienced by small-scale producers, in order to determine whether the crossbreeds offer tangible advantages.

2 Materials and methods

2.1 Study area

The study was conducted in Ouagadougou, at the Centre de Promotion de l'Aviculture Villageoise (CPAVI), between July 2023 and January 2024. Ouagadougou, capital city of Burkina Faso is situated at 12°40' N, 1°50' W, within the northern Sudanian ecological zone. The city experiences an average annual temperature of approximately 29 °C. Annual rainfall ranges from 600 to 800 mm, occurring mainly between June and October. The natural vegetation is characterised by a mix of trees and shrubs, with a dense herbaceous layer that becomes prominent during the rainy season.

2.2 Methodology

The experiment was carried out under intensive system, designed to mirror those typically encountered by small-scale poultry producers. These conditions included providing supplemental heat to chicks as needed, offering feed and water ad libitum, vaccinating the birds, restricting entry to the henhouse, and requiring foot and hand disinfection before access.

2.2.1 Mating plan and incubation management

Four batches of seven (7) Burkina Faso local pullets, each at the onset of the laying period (approximately six months old), were randomly selected. Two cocks from one of four breeds (Brahma (BR), Sasso (SA), North Holland Blue (NH), and the local breed (LO)) were introduced to each batch, with one breed assigned per batch. The cocks were approximately eight months old. The decision to include two cocks per batch aimed to introduce genetic diversity within each exotic breed. So, the matting plan was: BR (2 cocks) x LO (7 hens), SA (2 cocks) x LO (7 hens), NH (2 cocks) x LO (7 hens) and LO (2 cocks) x LO (7 hens).

The local chicken of Burkina Faso is small and slow-growing, with a wide variety of plumage colours. It thrives in harsh production environments and can be found throughout the country. The Brahma is an exotic breed in Burkina Faso; it is large but relatively slow-growing. The North Holland Blue is another exotic breed and a relatively fast-growing meat chicken. The Sasso cock used in this study was the Sasso Ruby N, a line developed by the French company Sasso. This bird has a naked neck, red plumage, and a rapid growth rate.

The four batches were housed in separate pens within the same poultry house, each on deep litter made of wood shavings. Approximately one month after the onset of the laying period, eggs were collected and stored by batch for one week. Each batch of eggs was then incubated separately. This procedure was repeated the following week to obtain a sufficient number of chicks. The number of eggs in each batch was 60, 60, 63 and 58 for the BR x LO, SA x LO, NH x LO and LO x LO crosses, respectively.

The incubators used in this study were locally assembled from imported components and were fully automated. The average incubation conditions were a temperature of 37.8 °C and a relative humidity of 60 %. On the seventh day of incubation, the eggs were candled to identify and remove any that were unfertilised. From the eighteenth day onwards, the eggs were transferred to hatcher baskets.

2.2.2 Chicks management and data collection

At hatching, which was at the end of August, each chick was weighed and individually identified. Due to the small diameter of their legs, a temporary identification system was implemented involving numbered tags printed on laminated paper, which were securely stapled to the right leg and replaced weekly to allow for leg growth. At two months of age, these temporary tags were replaced with conventional leg rings.

The chicks from each batch were housed in separate pens within the same henhouse and reared on deep wood-shavings for a period of 20 weeks. They were vaccinated against Newcastle disease, fowl pox, avian coryza, and Gumboro disease, in accordance with the manufacturers' instructions. Feed and water were provided in the morning and again in the afternoon as needed. The nutritional composition of the diets used is presented in Table 1.

During the study, average monthly minimum temperatures ranged from 18 °C (December 2023 and January 2024) to 26 °C (October 2023), while maximum temperatures varied from 33 °C (August 2023) to 37 °C (November 2023). Relative humidity fluctuated between 27 % (December 2023 and January 2024) and 85 % (August 2023). Body weights were recorded weekly up to 20 weeks of age using a Beurer KS 26 scale (5 kg capacity, 1 g precision). The same scale was used throughout the study to ensure measurement consistency. Mortalities were monitored daily, and causes of death, classified as natural (e.g., disease or sudden death) or accidental (e.g., pecking, vaccination injury, or predation), were recorded by observation along with the age at death for each chick.

Table 1: *Nutritional composition of chicken feed.*

Components	*Values*
Metabolisable energy (kcal/kg)	2824
Crude protein (%)	18.15
Fat content (%)	3.56
Lysine (%)	1.03
Methionine (%)	0.44
Methionine + Cysteine (%)	0.73
Calcium (%)	1.33
Phosphorus (%)	0.30
Sodium (%)	0.21
Chloride (%)	0.22
Crude fibre (%)	4.78

2.3 Statistical analyses

Statistical analyses were conducted using R software (version 4.3.2). A fixed-effects linear model was fitted to the body weight and average daily gain (ADG) data collected from hatching to 20 weeks of age. The model included the effects of genotype, sex, and their interaction. When the interaction effect was not statistically significant, a reduced model excluding the interaction term was applied.

Least squares means (LSM) and standard errors (SE) were computed for hatching weight and for body weights recorded at 4, 8, 12, 16, and 20 weeks, first by genotype and then by sex. Individual live weights at each of these time points were used to calculate the average individual daily gain (ADG) according to Equation (1). The resulting ADG values were then used to estimate the LSM and SE for genotype and sex at the different ages.

$$ADG_i = \frac{W_{it} - W_{i0}}{t} \quad (1)$$

Where:
ADG_i = average daily gain (g) for the individual i; W_{it} = weight (g) of the individual i at age t; W_{i0} = weight (g) of the individual i at hatching; t = age of individual in days.

In addition, weekly live weights were used to compute weekly average individual daily gains using Equation (2). The LSM of these weekly ADG values were calculated by genotype and used to plot the ADG evolution curves.

$$ADG_{it_i} = \frac{W_{it_i} - W_{it_{i-1}}}{7} \quad (2)$$

Where:
ADG_{it_i} = average daily gain (g) for the individual i at week t_i; W_{it_i} = weight (g) of the individual i at week t_i; $W_{it_{i-1}}$ = weight (g) of the individual i at week t_{i-1}.

Levene's test and the Shapiro-Wilk test were employed to assess the assumptions of homogeneity of variance and normality of residuals for both live weight and ADG at different ages. Where applicable, a two-way analyses of variance (ANOVA) was performed to test the effects of genotype and sex. Pairwise comparisons were carried out using the t-test and the Bonferroni adjustment method, with statistical significance set at the 5 % level.

All LSM, SE, and t-test calculations were performed using the lsmeans package in R (Lenth, 2016). Weekly body weights were also fitted using the Gompertz growth model for each genotype. This model was selected based on its reported suitability for describing growth in chickens (Mignon-Grasteau & Beaumont, 2000). The equation of the model used is shown in equation 3, as described by Gompertz (1825) and Winsor (1932). The corresponding equations for determining the inflection point parameters are also presented.

$$W(t) = ae^{-be^{-kt}} \quad (3)$$

Where:
$W(t)$ = body weight at age t (g); t = age of chicken (days); a = asymptotic or mature weight (g); b = integration constant related to initial weight; proportion of mature weight gained after birth; k = maturation rate, indicating how fast the animal approaches adult weight.

$$W_{ip} = \frac{a}{e} \quad (4)$$

$$A_{ip} = \frac{\ln(b)}{k} \quad (5)$$

$$r_{ip} = W_{ip} \cdot k \quad (6)$$

Where:
W_{ip} = body weight at inflection point (g); A_{ip} = age at inflection point (days); r_{ip} = growth rate at inflection point.

Finally, the mortality rates were calculated for the entire sample and for each genotype using equation 7. A chi-squared test or Fisher's exact test (expected values < 5) were performed to compare the genotype rates at the 5 % level of significance.

$$r_m = \frac{n_m}{n_T} \times 100 \quad (7)$$

Where:
r_m = mortality rate; n_m = number of dead chicks; n_T = total number of chicks at the beginning.

3 Results

3.1 Average weights at different ages

Levene's test and the Shapiro–Wilk test confirmed the assumptions of homogeneity of variance and normality for both live weight and average daily gain (ADG) at the different ages. Table 2 presents numbers of chicks and the least squares means of live weights at different ages, disaggregated by genotype and sex. At hatching, the average live weight of chicks ranged from 25.3 g (BR × LO) to 26.3 g (SA × LO), with no statistically significant differences observed among genotypes at the 5 % level.

From 4 to 20 weeks of age, the SA × LO genotype consistently exhibited significantly higher average live weights than the other genotypes ($p < 0.05$). No significant differences were observed between the BR × LO and NH × LO genotypes during this period. The local genotype (LO × LO) did not differ significantly from BR × LO or NH × LO genotype up to week 12. However, from week 16 onwards, its average live weight became significantly lower than that of BR × LO, and by week 20, it had the lowest average live weight among all groups. At this age, the SA × LO birds were almost 500 g heavier than the local genotype.

At hatching, male and female chicks weighed on average 25.6 g and 25.3 g, respectively, with no significant difference between sexes. This absence of sex-based differences persisted until eight weeks of age. From week 12 onwards, males exhibited significantly higher average live weights than females. By week 20, males reached an average weight of 1474 g, compared to 1133 g for females. A significant interaction between sex and genotype was observed only in the local group (LO × LO) at 12, 16, and 20 weeks of age. This interaction favoured local males, who showed a performance advantage over local females during this period (Table 3).

3.2 Growth performances

3.2.1 Average daily gains (ADG) at different ages

Table 4 presents the average daily gains (ADG) by genotype and sex at various ages. The SA × LO genotype consistently exhibited significantly higher ADG across all age intervals ($p < 0.05$). By 20 weeks of age, it had a growth rate of 11.04 g, compared to 7.56 g for the local breed,

Table 2: *Live weight least squares means (LSM) and standard error at different ages for the genotype and sex.*

Age	*Genotype*									*Sex*		
	BR × LO		*NH × LO*		*SA × LO*		*LO × LO*			*Male (n=69)*	*Female (n=71)*	
(weeks)	n	*x ± se* (g)	n	*x ± se* (g)	n	*x ± se* (g)	n	*x ± se* (g)	*Codes*	*x ± se* (g)	*x ± se* (g)	*Codes*
0	38	25.3 ± 0.42^{a}	54	25.7 ± 0.35^{a}	40	26.3 ± 0.43^{a}	36	25.6 ± 0.41^{a}	NS	25.6 ± 0.29^{a}	25.3 ± 0.28^{a}	NS
4	33	121.4 ± 7.41^{a}	50	116.8 ± 6.18^{a}	32	159.4 ± 7.98^{b}	35	97.2 ± 7.46^{a}	***	129 ± 5.11^{a}	119 ± 5.15^{a}	NS
8	32	345 ± 19.9^{a}	47	307 ± 16.8^{a}	31	513 ± 21.0^{b}	33	311 ± 20.3^{a}	***	383 ± 13.9^{a}	355 ± 13.7^{a}	NS
12	32	663 ± 28.6^{a}	45	642 ± 23.8^{a}	30	900 ± 29.7^{b}	33	590 ± 27.8^{a}	***	754 ± 19.5^{a}	644 ± 19.3^{b}	***
16	32	1009 ± 36.3^{ac}	45	966 ± 30.3^{a}	30	1220 ± 39.1^{b}	33	845 ± 35.4^{ad}	***	1133 ± 25.3^{a}	887 ± 24.6^{b}	***
20	32	1297 ± 38.9^{a}	45	1261 ± 32.5^{a}	30	1572 ± 39.8^{b}	33	1083 ± 38.0^{c}	***	1474 ± 26.7^{a}	1133 ± 26.1^{b}	***

For each row and by factor, the values with different superscript letters indicate significant differences at the 5 % level (t-test). BR = Brahma, NH = North Holland blue, SA = Sasso, LO = local, *x ± se* = LSM ± standard error, NS= not significant, *** = p-values< 0.001.

Table 3: *Estimated parameters of genotype, sex and their interaction effects on the live weight at 12, 16 and 20 weeks of age.*

	12 weeks		*16 weeks*		*20 weeks*	
	Est.	*Sign.*	*Est.*	*Sign.*	*Est.*	*Sign.*
Intercept	640.71	***	910.24	***	1156.05	***
Genotype NH	−47.29	*NS*	−41.48	*NS*	−55.38	*NS*
Genotype LO	−191.65	***	-300.97	***	−341.65	***
Genotype SA	239.90	***	235.53	***	290.38	***
Genotype BR	0	–	0	–	0	–
Sex Male	14.92	*NS*	175.67	*	255.04	**
Sex Female	0	–	0	–	0	–
NH × Sex Male	83.65	*NS*	21.94	*NS*	67.33	*NS*
LO × Sex Male	252.07	**	276.78	**	266.45	*
SA × Sex Male	31.03	*NS*	−23.44	*NS*	2.15	*NS*
BR × Sex Male	0	–	0	–	0	–

Est. = estimate; Sign. = significance; NS= not significant,
*** = $p < 0.001$, ** = $p < 0.01$, * = $p < 0.05$; BR = Brahma, NH = North Holland blue, SA = Sasso, LO = local.

i.e. a difference of around 3.5 g per day. In contrast, no significant differences were found between the BR × LO and NH × LO genotypes across all age intervals. The local genotype (LO × LO) did not also differ significantly from BR × LO and NH × LO over the 0–12 week period. However, over the 0–16 week interval, its ADG became significantly lower than that of BR × LO, and over the entire 0–20 week period, LO × LO recorded the lowest ADG among all genotypes.

With regard to sex, no significant differences in ADG were observed up to 8 weeks of age. However, from the 0–12 week period onward, males exhibited significantly higher ADG than females. Over the full experimental period (0–20 weeks), the average ADG was 10.35 g for males and 7.91 g for females.

3.2.2 Average daily gain evolution

Fig. 1 illustrates the weekly evolution of average daily gain (ADG) for the four genotypes. The curves indicate an initial phase of regular and rapid growth, followed by a period of more irregular variation. During this second phase, however, the overall trend remained slightly upward across all genotypes.

ADG followed a consistent pattern during the first five weeks for all genotypes. From week six onwards, the SA × LO genotype exhibited noticeable irregular fluctuations. In contrast, the onset of irregularity occurred later for the other genotypes: in week eight for both LO × LO and BR × LO, and in week ten for NH × LO.

3.2.3 Gompertz growth curves parameters

Table 5 summarises the Gompertz model parameters. Among the genotypes, the BR × LO genotype demonstrated

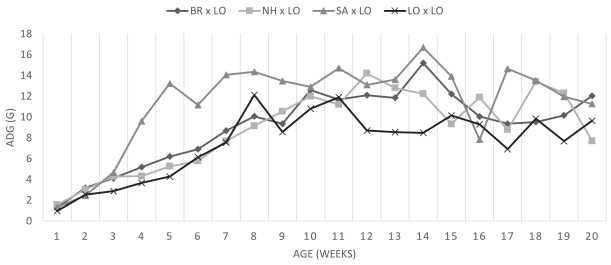

Fig. 1: *Evolution of average daily gain (g per week) as a function of age for the four genotypes.*
ADG = average daily gain, BR = Brahma, NH = North Holland blue, SA = Sasso and LO = local

the best fit to the Gompertz model, as indicated by the lowest Akaike Information Criterion (AIC) and a coefficient of determination (R^2) of 95 %. In contrast, the LO × LO genotype showed the weakest model fit, with the growth curve accounting for only 77 % of the observed variance. Estimated asymptotic weights ranged from 1,490 g for the local breed (LO × LO) to 2,027 g for the SA × LO genotype while the integration constants ranged from 4.30 (SA × LO) to 4.69 (NH x LO). The maturation rates (k) were 0.018, 0.017, 0.020, and 0.019 for the BR × LO, NH × LO, SA × LO, and LO × LO genotypes, respectively. The SA × LO had the best live weights at the inflection point (746 g) while the LO × LO genotype had the lowest (548 g). The inflection point was reached at an earlier stage (72 days) by the SA × LO genotype, and at the latest stage (91 days) by the NH × LO genotype. The LO × LO genotype reached it at 80 days. The maximum growth rates at the inflection point ranged from 10.4 g/day for LO × LO to 14.9 g/day for SA × LO.

3.2.4 Mortality rates

The overall mortality rate observed in the sample was 16.67 %. The local breed (LO × LO) exhibited a significantly lower mortality rate compared to the SA × LO genotype ($p < 0.05$), while no statistically significant differences were observed among the other genotypes. The majority of deaths (11.9 %) were attributed to natural causes (disease or sudden death), although a smaller proportion resulted from accidental events such as pecking, injuries during vaccination, and predator attacks. Natural mortality was particularly concentrated in the first week of life, accounting for 10.12 % of total losses (Table 6).

4 Discussion

4.1 Live weights

There were no significant differences in hatching weights between genotypes or sexes, suggesting that embryo devel-

Table 4: *Least squares means (LSM) of the average daily gain and standard error at averaged intervals.*

	Genotype									*Sex*		
Age	*BR × LO*		*NH × LO*		*SA × LO*		*LO × LO*			*Male (n=69)*	*Female (n=71)*	
(weeks)	n	*x ± se* (g)	n	*x ± se* (g)	n	*x ± se* (g)	n	*x ± se* (g)	*Codes*	*x ± se* (g)	*x ± se* (g)	*Codes*
0–4	33	3.43 ± 0.26^{a}	50	3.29 ± 0.22^{a}	32	4.76 ± 0.28^{b}	35	2.55 ± 0.26^{a}	***	3.68 ± 0.18^{a}	3.33 ± 0.18^{a}	*NS*
0–8	32	5.70 ± 0.35^{a}	47	5.05 ± 0.30^{a}	31	8.70 ± 0.37^{b}	33	5.10 ± 0.36^{a}	***	6.38 ± 0.25^{a}	5.89 ± 0.24^{a}	*NS*
0–12	32	7.59 ± 0.34^{a}	45	7.35 ± 0.28^{a}	30	10.4 ± 0.35^{b}	33	6.72 ± 0.33^{a}	***	8.67 ± 0.23^{a}	7.36 ± 0.23^{b}	***
0–16	32	8.78 ± 0.33^{ac}	45	8.41 ± 0.27^{a}	30	10.58 ± 0.35^{b}	33	7.32 ± 0.32^{ad}	***	9.84 ± 0.23^{a}	7.70 ± 0.22^{b}	***
0–20	32	9.08 ± 0.28^{a}	45	8.83 ± 0.23^{a}	30	11.04 ± 0.28^{b}	33	7.56 ± 0.27^{c}	***	10.35 ± 0.19^{a}	7.91 ± 0.19^{b}	***

For each row and by factor, the values with different superscript letters indicate significant differences at the 5 % level (t-test). BR = Brahma, NH = North Holland blue, SA = Sasso, LO = local, *x ± se* = LSM ± standard error, NS= not significant, *** = p-values< 0.001.

Table 5: *Estimated growth parameters and the inflection-point traits for the different genotypes.*

Parameter	*BR × LO (n=32)*	*NH × LO (n=45)*	*SA × LO (n=30)*	*LO × LO (n=33)*
a (g)	1795	1999	2027	1490
b	4.48	4.69	4.30	4.61
k	0.018	0.017	0.020	0.019
W_{ip} (g)	660	735	746	548
A_{ip} (days)	83	91	72	80
r_{ip} (g/day)	11.9	12.5	14.9	10.4
AIC	8178.5	12614.9	8330.3	9144.7
R^2	0.95	0.90	0.86	0.77

a = asymptotic or mature weight; *b* = integration constant related to initial weight; *k* = maturation rate; W_{ip} = body weight at inflection point; A_{ip} = age at inflection point; r_{ip} = growth rate at inflection point; AIC = Akaike Information Criterion; R^2 = coefficient of determination.

Table 6: *Mortality rates for the genotypes and overall sample.*

Mortality (in %)	*BR × LO (n=32)*	*NH × LO (n=45)*	*SA × LO (n=30)*	*LO × LO (n=33)*	Overall *(n=168)*
Total	15.79^{a}	16.67^{a}	25^{ab}	8.33^{ac}	16.67
Natural	10.53^{a}	12.96^{a}	20^{ab}	2.78^{ac}	11.90
in first week	10.53^{a}	7.41^{a}	20^{ab}	2.78^{ac}	10.12

For each row, the values with different superscript letters show significant differences at 5 % level (CHI2 or Fisher's exact test).

opment was not influenced by these factors. This finding is consistent with the literature, as the hatching weight is primarily determined by egg characteristics, particularly egg weight (Sanfo *et al*., 2017; Dzungwe *et al*., 2022). Since all eggs used in the present study originated from the same type of hen, homogeneity in chick weights was expected. Similar results were reported by Keambou *et al*. (2015), who found comparable hatching weights when crossing a Hubbard cock with a local Cameroonian breed.

Although SA × LO exhibited the highest live weights, they remained lower than values reported by Bilalissi *et al*. (2022), likely due to differences in maternal effects, selection history, or feed type. The absence of any significant difference in live weight between the BR × LO, NH × LO and LO × LO genotypes up to 12 weeks of age suggests that, for producers aiming to slaughter at around three months, the two crossbreeds do not offer any notable growth benefits. The live weights observed at 12 weeks in this study were higher than those reported for crosses between White Leghorn cocks and Fayoumi hens (Balcha *et al*., 2021), but lower than those from crosses involving Sasso and Wassacre chickens (Dzungwe *et al*., 2022), which could be attributed to genotypic differences.

The delayed expression of superiority in BR × LO and NH × LO may be related to the fact that Brahma and North Holland Blue breeds have not been subject to the same level of selection for early growth and slaughter age as the Sasso breed. However, such late advantages are less desirable in commercial production systems where shortening production cycles is essential. Moreover, the 16-week weights for all genotypes in this study were lower than those reported by Itafa *et al*. (2021) for Sasso × Koekoek crosses, likely due to genetic differences between Koekoek and the local breed used in this study.

Regarding sex, the appearance of a significant difference from 12 weeks onwards can be explained by the onset of puberty and the appearance of sexual dimorphism. Notably, the local genotype (LO × LO) showed a significant sex-by-genotype interaction from this stage, giving local cocks a relative advantage and contributing to more pronounced sexual dimorphism within this genotype. Culling females and rearing males could be a more economically viable option for local chicken meat production.

4.2 Growth performance

The higher growth rate of SA × LO, compared with the local breed and other crosses, largely explains its superior final body weights, while BR × LO and NH × LO only show late-stage advantages, limiting their suitability for short-cycle production.

The weekly evolution of ADG showed an initial phase of rapid and regular growth, followed by a second phase characterized by slower and more irregular changes. Keambou *et al*. (2015) similarly reported a rapid increase in ADG up to the sixth week in both local and crossbred chicks (Hubbard × local) in Cameroon. In the present study, the SA × LO genotype, which had the highest growth rate, entered the irregular phase as early as the fifth week, while the other genotypes reached this phase later. This suggests that the transition to irregular growth may be more closely linked to reaching a certain weight rather than a specific age, a hypothesis that warrants further investigation. The poor fit of the LO × LO data to the Gompertz model can be explained by a higher variability within genotypes and the pronounced sexual dimorphism mentioned above. These factors could have resulted in heterogeneous growth trajectories and suggest that improvement through selection is possible. Gompertz model parameters confirmed the superior growth potential of the SA × LO genotype. This genotype had the highest asymptotic weight, reached its inflection point earliest, and exhibited the highest growth rate at this point. These results align with expectations, as Sasso chickens have undergone selection to improve growth and reduce age at slaughter, factors known to influence asymptotic weight and growth precocity (Mignon-Grasteau & Beaumont, 2000; Mancinelli *et al*., 2023).

Interestingly, the local breed (LO × LO), despite having the lowest asymptotic weight and undergoing no selection, reached its inflection point earlier than the BR × LO and NH × LO genotypes. This can be attributed to its lower mature weight: at similar growth rates during early life, the local breed logically reaches its mature size, and thus its inflection point, more quickly. Mancinelli *et al*. (2023) reported similar findings with a local Italian breed reaching its inflection point earlier than a heavier breed.

4.3 Mortality rates

The crossbreed with the highest weight (SA × LO) also exhibited the highest mortality rate and the LO × LO genotype showed the lowest mortality rate, significantly different only from the SA × LO genotype. This indicates that heterosis did not lead to improved survival (i.e., no overdominance effect). It also suggests that SA × LO may require improved management or environmental conditions to perform optimally. The high growth rate of these chickens, which they inherited from the Sasso breed, could explain their greater fragility. As they devote most of their energy to growing, they no longer have enough left over to protect themselves. These results support the idea that, while crossbreeding may improve growth, it does not necessarily enhance survival, which may even be compromised without adequate management. These findings differ from those of Itafa *et al*. (2021), who reported lower mortality in Koekoek × Sasso crossbreeds compared to local Koekoek chickens. Keambou *et al*. (2015) also recorded no mortality during a 7-week rearing period involving a local Cameroonian breed and its crossbreeds with Hubbard. It should be noted that the mortality rate in the present study could likely be reduced with better housing conditions and improved management practices. A significant proportion of deaths occurred during the first week of life, mostly due to natural causes. Enhancing housing conditions and hygiene during this critical period could help reduce early chick mortality.

5 Conclusion

The aim of this study was to evaluate and compare the growth and survival performance of crossbred and local chickens. Overall, the BR × LO and NH × LO genotypes exhibited delayed growth, making them less suitable for short-cycle meat production. By contrast, the SA × LO genotype displayed the most favourable growth parameters, making it the most promising option for enhancing meat production. This crossbreeding must therefore be promoted among producers. However, this must be done within a well-organised framework to ensure the proper management of genetic resources. In view of the high mortality rate observed in these crosses, an in-depth study is also needed to better understand the causes, with the aim of reducing mortalities.

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Conflict of interest

The authors declare that there is no conflict of interest.

Ethical approval

During the experimentation, the institutional and national standards for the care and welfare of animals were followed. The experimentation was approved by the animal experimentation ethics committee of Joseph Ki Zerbo University (Burkina Faso), NO: CE-UJKZ/2024-10.

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