



THE ECONOMIC SHOCK OF CONFLICT: A COMPARATIVE ANALYSIS OF BROILER PRODUCTION COSTS IN SUDAN PRE-WAR (2023) AND POST-WAR (2025) AGAINST GLOBAL BENCHMARKS

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ABSTRACT

This study provides a focused economic analysis of the broiler production sector in Sudan, comparing its pre-war (2023) efficiency with its post-war (2025) condition, benchmarked against global standards. Utilizing normalized data (2024 constant USD), the research examines cost structures, biological performance, and economic resilience in the face of profound systemic disruption. Before the 2023 conflict, Sudan's production cost was USD 0.95/kg live weight, already 22% above the global benchmark of USD 0.78/kg. The war triggered a catastrophic cost escalation, with the 2025 post-war cost soaring to USD 1.75/kg, a 142% deviation from the global standard. This surge was driven by a five-fold currency devaluation, the destruction of most large integrated broiler companies including parent-stock farms forcing reliance on imported fertilized eggs, and a shift to costly diesel-generated power, which multiplied energy expenses. Despite this, some recovery efforts emerged through private-sector partnerships that resumed fertile egg imports and limited hatchery operations, partially restoring supply but at high cost. The Day-Old Chick (DOC) cost share exploded from 22.8% to 38.9% of total costs. Despite these shocks, the sector demonstrated notable biological resilience, maintaining a feed conversion ratio (FCR) of 1.5. The findings underscore that the crisis is primarily economic and infrastructural, not biological. The study concludes that targeted interventions focusing on hatchery rehabilitation, feed sovereignty, renewable energy adoption, and macroeconomic stabilization are critical for restoring Sudan's poultry sector and its vital role in national food security.

Keywords: Broiler Economics; Sudan; Post-War Recovery; Production Costs; Resilience; Global Benchmark; Food Security; Conflict Agriculture.

INTRODUCTION

Poultry production, particularly broilers, is a critical component of global food security, providing an efficient source of high-quality animal protein. In developing nations, it is a key driver of rural livelihoods and economic activity. However, the sector's viability is highly sensitive to disruptions in input supply chains, energy access, and macroeconomic stability (FAO, 2023). Sudan's broiler industry, once a regionally significant sector, offers a stark case study of how violent conflict can dismantle agricultural systems and distort production economics.

The outbreak of war in Sudan in 2023 precipitated a collapse in the country's agricultural infrastructure, including its poultry sector. The destruction of breeder farms, a five-fold currency devaluation, and severe energy shortages created a production environment of extreme duress. This study moves beyond a static analysis to capture a dynamic "before- and-after" perspective, quantifying the economic impact of war on broiler production.

This paper systematically compares the cost structure and biological performance of Sudan's broiler sector in 2023 (pre-war) and 2025 (post-war recovery), using globally recognized efficiency standards as a benchmark. The objective is to identify the specific drivers of cost escalation, assess the sector's adaptive resilience, and

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provide evidence- based recommendations for a recovery pathway that could realign Sudanese production with international competitiveness.

2. Literature Review

2.1. Sudan's Pre-War Poultry Sector

Before the 2023 war, Sudan's broiler industry was characterized by a reliance on locally sourced inputs. The sector operated primarily on locally produced Day-Old Chicks (DOC) and feed based on sorghum and oilseed meals (peanut, sesame, sunflower), with minimal imports of maize or soybean (Elghouth et al., 2013). Studies established a baseline for the sector's economics, with DOC representing about 23% of total cost and feed accounting for approximately 58%, resulting in a total cost of USD 0.81/kg live weight and an FCR around 1.4-1.5. Earlier work by Emam and Hassan (2011) and Eltigani (2009) documented the profitability and structural challenges of poultry production in Khartoum State, highlighting its potential and vulnerabilities.

2.2. The Impact of War on Agricultural Systems

The 2023 conflict fundamentally shattered this structure. The Sudanese Pound depreciated drastically, and fuel scarcity forced a near-total reliance on diesel generators, crippling the agricultural input supply chain (CRU, 2024). The literature on agricultural systems in conflict zones is clear: such events disrupt every node of the value chain, from input supply to market access, leading to massive cost inflation and forcing producers into survival-based adaptations. This study directly addresses the gap in quantitative, field-verified data on how these dynamics have specifically affected broiler production economics in Sudan.

3. Methodology

3.1. Study Design and Data Sources

This study adopts a comparative case study design, analyzing Sudan's broiler production at two distinct points: pre-war (2023) and post-war (2025). The performance at each stage is evaluated against a constant global benchmark derived from FAO (2023) and USDA (2023) efficiency standards.

Data for the pre-war scenario were drawn from peer-reviewed literature and pre-war projections. The post-war (2025) data are based on field-verified estimates (Appendix 1), local expert interviews, and reports from humanitarian and research organizations, including the CRU (2024) report on Sudan's agricultural input supply during the war.

3.2. Data Standardization

All financial data were converted to U.S. dollars (USD) to ensure comparability. For the post-war scenario, a conversion rate of 1 USD = 3,600 SDG (as of 2025) was applied to reflect the severe currency depreciation. All costs are expressed in 2024 constant USD.

3.3. Analytical Framework

The analysis focuses on:

1. **Cost Structure:** Decomposition of total cost per bird into DOC, feed, labor, housing, veterinary, and mortality.
2. **Key Performance Indicators (KPIs):** Cost per kg live weight, FCR, mortality rate, live weight, and production cycle length.
3. **Sensitivity Analysis:** Assessment of the impact of $\pm 10\%$ fluctuations in feed and DOC prices on the total cost per kg.

4. Results

4.1. Comparative Cost Structure and Performance

The analysis reveals a dramatic deterioration in economic performance (Table 1). The total cost per bird increased by 105%, from USD 1.71 to USD 3.50. Consequently, the cost per kg of live weight rose from USD 0.95 to USD 1.75. The most significant shift occurred in the cost structure: the share of DOC costs surged from 22.8% to 38.9% of the total, becoming the dominant cost driver, while the feed cost share decreased from 58.6% to 45.2% due to the disproportionate rise in other inputs.

Table 1. Sudan Broiler Cost Structure and Performance: 2023 vs. 2025 vs. Global Benchmark

Component	Sudan 2023	Sudan 2025	Global Benchmark
Day-Old Chicks (USD/bird)	0.39 (22.8%)	1.36(38.9%)	0.36 (22%)
Feed (USD/bird)	1.00 (58.6%)	1.58 (45.2%)	0.93 (56.7%)
Labor and Overheads	0.12 (6.9%)	0.06 (1.7%)	0.14 (8.7%)
Housing and Utilities	0.12 (6.9%)	0.29 (8.3%)	0.12 (7.3%)
Veterinary and Vaccination	0.06 (3.5%)	0.08 (2.4%)	0.07 (4.0%)
Mortality and Wastage	0.02 (1.4%)	0.13 (3.6%)	0.02 (1.3%)
Total per Bird (USD)	1.71	3.5	1.64
Live Weight (kg)	1.8	2	2.1
Cost per kg (USD)	0.95	1.75	0.78
Feed Conversion Ratio (FCR)	1.7	1.5	1.6

Cycle (days)	35	36	35-42
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Source: Author's calculations based on 2025 field data; all costs expressed in USD at 1 USD = 3,600 SDG.

Table 2. Sensitivity of Broiler Cost per kg (USD) to Input Price Fluctuations

Country	Base cost (USD/kg)	Δ% Feed (±10%)	Δ% DOC (±10%)
Sudan 2023 (Pre-war)	0.95	±5.85%	±2.28%
Sudan 2025 (Post-war)	1.75	±3.7%	±3.0%
Global Benchmark	0.78	±5.66%	±2.19%

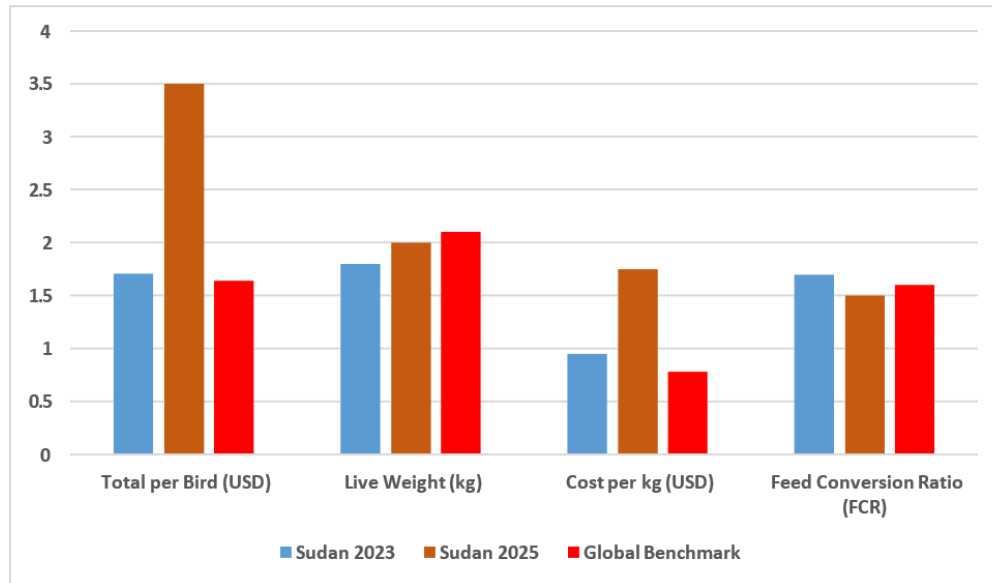


Figure 1. : Comparative total cost per bird (USD), live weight (Kg), cost per Kg (USD), and FCR of Sudan 2023, Sudan 2025, compared to Global benchmark

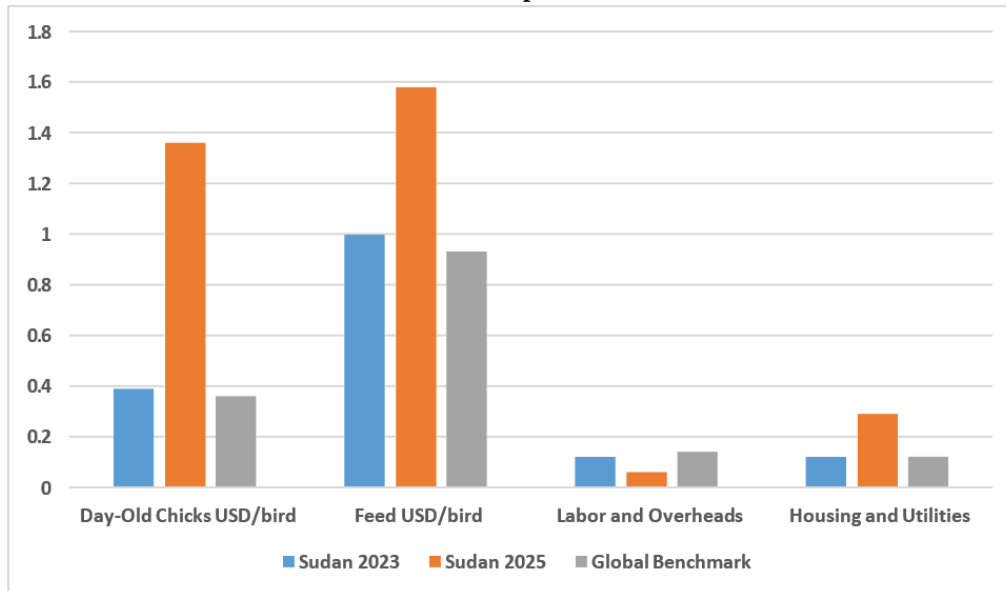


Figure 2. : Comparative DOC, feed, labor and housing costs per bird (USD of Sudan 2023, Sudan 2025, compared to Global benchmark

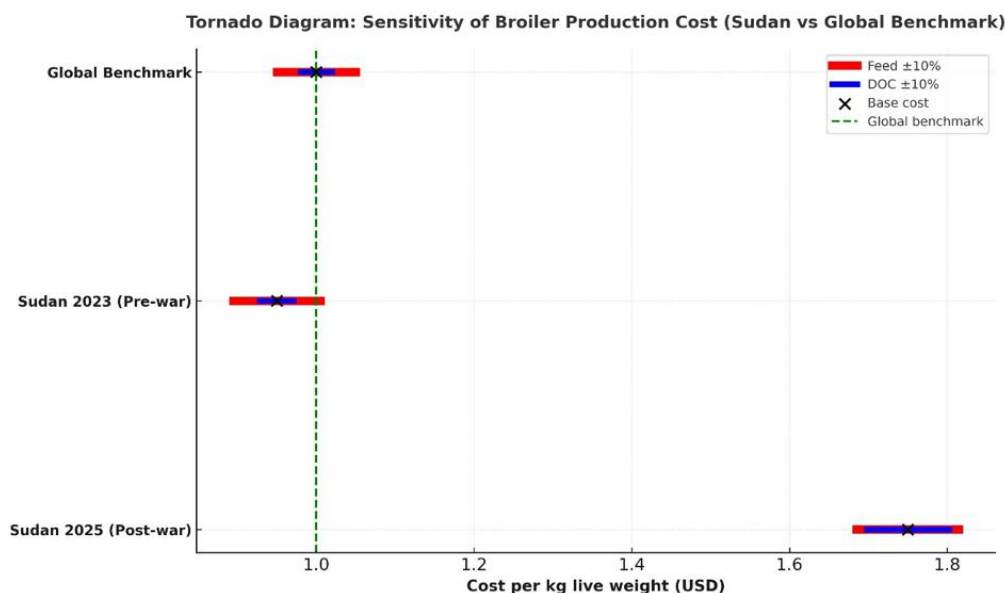


Figure 3. Compared Sensitivity of Sudan 2023 and Sudan 2025 broiler production costs to feed and DOC,

4.2. Sensitivity Analysis

The war also altered the sector's vulnerability to input price shocks (Table 2). In the pre-war scenario, a $\pm 10\%$ change in feed price had a $\pm 5.85\%$ impact on the cost per kg. In the post-war scenario, this sensitivity decreased to $\pm 3.7\%$, reflecting the lower proportional share of feed. Conversely, sensitivity to DOC prices increased, from $\pm 2.28\%$ to $\pm 3.0\%$, underscoring the new risk profile dominated by chick costs.

5. Discussion

5.1. The Anatomy of Economic Collapse

The post-war data depicts an industry operating under extraordinary constraints. The quintupling of DOC costs is the most direct consequence of the war, stemming from the destruction of domestic hatcheries and parent-stock farms. This forced a complete reliance on imported fertilized eggs, a process made prohibitively expensive by currency devaluation and complex logistics. Furthermore, the collapse of the national grid forced producers onto diesel generators, multiplying energy costs and contributing to the sharp rise in housing and utilities expenses.

The tripling of mortality and wastage (from 1.4% to 3.6%) points to degraded chick quality, inconsistent brooding conditions due to power instability, and compromised veterinary supply chains. These factors eroded flock uniformity and increased losses.

5.2. Signs of Adaptive Resilience

Despite the overwhelming challenges, the sector demonstrated remarkable biological resilience. The improvement in FCR from 1.7 to 1.5 suggests that surviving producers adapted their management practices, potentially by shifting to shorter production cycles (36 days) and lighter market weights (2.0 kg live weight) to mitigate cumulative cost exposure and reduce biological risk. This adaptive management, while a rational response to crisis, results in a lower dressing percentage and reduced overall meat yield.

5.3. Strategic Implications for Recovery

The analysis suggests that Sudan's broiler crisis is fundamentally economic and infrastructural, not biological. The maintained FCR of 1.5 indicates that the core knowledge and husbandry skills survived the conflict. Therefore, recovery is feasible with targeted interventions that address the key distortion points:

1. Hatchery Rehabilitation: Rebuilding parent-stock capacity is the single most important step to reduce DOC costs and import dependency.
2. Energy Diversification: Introducing solar-powered solutions for brooding and milling can drastically cut the largest variable cost.
3. Feed Sector Stabilization: Supporting local sorghum and oilseed production through structured contracts can shield the sector from global market volatility.
4. Macroeconomic Stabilization: Restoring currency stability and access to credit is a prerequisite for sustainable recovery.
5. If these pillars are addressed, modeling suggests production costs could fall to USD 1.10- 1.20/kg within several production cycles, dramatically narrowing the gap with global benchmarks.
6. Conclusion and Recommendations

This study quantifies the devastating economic impact of war on Sudan's broiler sector, with production costs more than doubling and the cost structure becoming dangerously skewed towards imported inputs. However, it also identifies a pathway for recovery rooted in the sector's demonstrated biological resilience.

Key Recommendations for a Recovery Framework:

1. **Immediate:** Facilitate the importation of grandparent stock and establish bio-secure hatchery zones in stable regions to restart local DOC production.
2. **Short-Term:** Distribute solar-powered brooding systems and feed millers to reduce dependence on diesel and lower operational costs.
3. **Medium-Term:** Implement structured contracts for local sorghum and oilseed farmers to secure a stable, affordable feed base.
4. **Policy-Level:** Create a dedicated credit facility with donor support to provide producers with affordable capital for restocking and infrastructure repair.

The experience of Sudan's broiler producers from 2023 to 2025 is a testament to the fragility of agri-food systems in conflict settings, but also to the potential for recovery when resilience is met with targeted, intelligent support.

7. Acknowledgements

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ملخص الدراسة:

مع وضعه في فترة ٢٠٢٠-٢٠٢٤، راسة تحليل اقتصادي مركز لقطاع إنتاج دجاج اللحم في السودان مقارنة كانه في فترة ما قبل الحرب م هذه الفترة راسة في هيكل التكاليف والأداء البيولوجي ' تبحث الذ ٢٠٢٤ مع المقارنة بتعايير عالمية باستخدام بيانات موحدة دولر أمريكي ثابت لعام ٢٠٢٠ ما بعد الحرب صراع في عامي العميق قبل ال ٢٠٢٠ نظام 'ي والمرونة الاقتصادية في مواجهة الصعوبات الن' دولر كجم وزن حي متجاوزة بالعل المعيار ٢,٥٢ كانت تكله الإنتاج في السودان ٢٠٢٠ % أشعلت الحرب قبل تصاعد كارثي في التكاليف ٠٠ دولر كجم بتسبة ٢,٨٧ العالمي البالغ ني. % عن المعيار العالم ١٠٢ دولر كجم بانحراف قدره ١,٨٢ إلى ٢٠٢٠ حيث ارتفعت التكله في فترة ما بعد الحرب عام ف وتدمير معظم الشركات الكبيرة المتكاملة، دفعت هذه الموجة ارتفاعا هائلا في التكاليف نتيجة انخفاض قيمة العملة بمقدار خمسة أضعاف لإنتاج الدواجن بما في ذلك مزارع القطعان الأسبوعية يرزلبا فرض العتماد على بيض النقيس المستورد والنقل إلى الطاقه المؤلدة بواسطة الذ المكلف مما ضاعفت نفقات الطاقه على الرغم من ذلك برزت بعض جهود التعافي من خلال ص التي استأنفت استيراد بيض النقيس وعمليات التوزيع المحدودة مستعيدة شراكات القطاع الخا ٠٠ لي التكاليف % من إجمما ٢,٧٥ % إلى ٢٠,٠٧ م من ٠٠، وانجزت حصه تكله الكنايت بعمر ٠٠، عالي، العرض جزئيا ولكن بكل كذ ' وتؤ ١,٢٠٠ يتلغ FCR، ي، وعلى الرغم من هذه الصدمات أظهر القطاع مرونة بيولوجية ملحوظة محافطاً على معدل تحويل عل راسة إلى أن التخللات المستهدفة التي تركز على النتائج على أن الأزمة هي في المقام الأول اقتصادية وهيكلية وليس بيولوجية وتخلص الذ ي هي أمور حاسمة لاستعادة قطاع ' دة واستقرار القطاع الكا سيادة على الأعلاف واعتماد الطاقه المنجدة إعادة تأهيل الماقيس وتحقيق ال ٠٠ الدواجن في

Appendix: 1

Broiler Production Cost and Performance Survey Form

Study Title: A Comparative Analysis of Broiler Production Costs in Sudan Pre-War (2023) and Post-War (2025) Against Global Benchmarks.

Purpose: This survey aims to collect accurate information on the cost structure, management practices, and performance of broiler farms to improve understanding of economic impact of 2023 war.

Confidentiality: All responses will be kept confidential and used for research purposes only.

Section 1: Farm Identification

1. Country: ☐ Sudan 2. Governorate / Region:
3. Type of operation: ☐ Small-scale ☐ Medium ☐ Large / Commercial

4. Ownership type: ☐ Private ☐ Cooperative ☐ Contract farming ☐ Integrated company
5. Number of broiler cycles per year: cycles
6. Average flock size per cycle: birds

Section 2: Production Parameters

7. Average rearing period (days):
8. Average live weight at sale (kg/bird):
9. Feed Conversion Ratio (FCR):
10. Mortality rate (%):
11. Broiler strain used:
12. Source of chicks: ☐ Local hatchery ☐ Imported
13. Average stocking density (birds/m²):

Section 3: Cost Structure (Per Cycle or Per Bird)

Cost Component Amount % of Total Cost

Day-old chicks (DOC) %

Feed%

Labor (including management) %

Housing and utilities (energy, water, litter) %

Veterinary care, vaccination, and medication %

Transportation and marketing %

Mortality and wastage losses %

Total Cost per Bird %

Section 4: Feed and Nutrition

22. Type of feed used: ☐ Commercial complete feed ☐ On-farm mix
23. Main feed ingredients:
24. Feed source: ☐ Local ☐ Imported ☐ Both
25. Feed price per kg (USD or local currency):
26. Any use of feed additives or enzymes? ☐ Yes ☐ No
27. If yes, please specify:

Section 5: Labor and Mechanization

28. Number of permanent workers:
29. Number of temporary workers:
30. Main labor activities:
31. Mechanization level: ☐ Manual ☐ Semi-automated ☐ Fully automated
32. Automated systems present: ☐ Feeding ☐ Drinking ☐ Climate control ☐ Waste removal

Section 6: Health and Biosecurity

33. Major diseases encountered:
34. Biosecurity measures in place: ☐ Disinfection ☐ Entry restriction ☐ Protective clothing ☐ Vaccination schedule
35. Veterinary supervision: ☐ Regular ☐ Occasional ☐ None

Section 7: Economic and Market Factors

36. Average selling price per kg live weight (USD or local):
37. Main market outlet: ☐ Local market ☐ Wholesaler ☐ Processor ☐ Export
38. Access to credit or government support: ☐ Yes ☐ No
39. Challenges affecting profitability:

Section 8: Farmer's Perception

40. What is the most expensive input?
41. How do exchange rate changes affect your operation?
42. What improvements would most help your farm?

Section 9: Research Consent

I confirm that the information provided is accurate to the best of my knowledge and may be used anonymously for research purposes.

Name (optional):

Signature:

Date: / / 2025