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# Factors Associated with Meat Export Performance in Rwanda: The Influence of Livestock Production Capacity, Quality and Sanitary Standards, Value Addition, Market Access and Trade Facilitation, 2017–2026

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***Abstract:*** *This study examines factors associated with Rwanda's meat export performance over 2017–2026: livestock production capacity, quality and sanitary standards, value addition, market access and trade facilitation. Using a documentary design, it synthesises statistics from MINAGRI, NAEB, NISR, RAB, RICA, the World Bank and UN Comtrade-based databases, graded by a three-tier verification protocol, and applies descriptive, correlation, regression and chi-square analyses. Meat output rose from 152,029 MT to 207,097 MT (CAGR 5.3%) and was strongly associated with the cattle population ($r = 0.992$, $p < 0.001$), though not after detrending. Meat exports rose from US$8.87 million in 2021/22 to US$22.3 million in 2022/23 (+151.4%), yet represented only 1.4–2.6% of agricultural export earnings; live animals formed 54.3% of livestock exports versus 20.5% for meat. Customs-recorded meat exports (HS 02) were US$1.95–3.91 million in 2021–2022, below meat imports, while certified frozen beef to China earned US$4.52/kg versus an average of US$1.62/kg. Only 7 of 48 slaughterhouses exceeded 70% compliance, which varied by facility type ($\chi^2 = 9.25$, $p = 0.010$). Logistics performance stagnated; over 90% of diversified exports went to neighbouring markets. The evidence is consistent with H2–H4, partially consistent with H1, and does not establish H5; results indicate associations, not causation. It recommends export-grade abattoirs and cold chains, processed meat instead of live-animal exports, stronger SPS compliance, AfCFTA market diversification, better cross-border logistics, and a consistent meat export series.*

***Keywords:*** *Meat Exports; Livestock Production; Sanitary and Phytosanitary Standards; Value Addition; Market Access; Trade Facilitation; Documentary Research; Rwanda.*

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# 1. Introduction

Livestock is one of the fastest-growing agricultural sub-sectors in developing economies, driven by population growth, urbanisation and rising incomes that raise the demand for animal-source foods, a structural shift that Delgado et al. (1999) called the "livestock revolution". Global meat trade is projected to keep expanding, with Sub-Saharan Africa remaining a net importer despite its large herd base (FAO, 2023; OECD/FAO, 2023). For small, landlocked economies such as Rwanda, converting livestock into higher-value exports is therefore both a diversification opportunity and a foreign-exchange strategy, consistent with evidence that

the sophistication and composition of a country's export basket matter for growth (Cadot et al., 2011; Hausmann et al., 2007). In Rwanda, agriculture contributes roughly a quarter of GDP and around one-third of national export earnings, while the livestock sub-sector is anchored in national policy frameworks including Vision 2050, the National Strategy for Transformation (NST1, 2017–2024; NST2, 2024–2029), the Fourth and Fifth Strategic Plans for Agriculture Transformation (PSTA4, 2018–2024; PSTA5, 2024–2029), the Rwanda Livestock Master Plan (Shapiro et al., 2017) and the Livestock Development Strategy (LDS) 2024–2029 (MINAGRI, 2018, 2024). Livestock numbers and animal-product output have grown steadily, supported by the Girinka programme, which had distributed 427,576 cows to poor households by June 2022, and by artificial insemination, small-stock distribution and disease control (MINAGRI, 2022). Meat production increased from 74,519 MT in 2012 to 197,778 MT in 2022/23 and reached 207,097 MT in 2023/24, about 96.3% of the PSTA4 target of 215,058 MT (Food Business MEA, 2025a; MINAGRI, 2024). Agricultural exports have also expanded markedly, from US$515.9 million in 2017/18 to US$857.2 million in 2022/23 and a reported US$1.1 billion in 2025/26 (Bantu Gazette, 2026; MINAGRI, 2022; NAEB, 2024). Meat has emerged as a promising non-traditional export: NAEB data show that meat export earnings rose from about US$8.9 million in 2021/22 to US$22.3 million in 2022/23 (Umutesi, 2024).

Yet meat remains a marginal item in the export basket, and Rwanda continues to export large numbers of live animals, principally to the Democratic Republic of Congo (DRC), foregoing the value that domestic slaughtering, processing and packaging would retain (MINICOM, 2016; Rwanda Today, 2020). Despite growth in livestock population and meat output, Rwanda's meat export performance has remained modest, volatile and highly concentrated. As early as 2017, the Government observed that more than 30,000 cattle were exported to the DRC every month while domestic abattoirs had sufficient installed capacity to slaughter them, and estimated that each kilogram of meat exported instead of live animals would earn about US$7 more (MINAGRI, 2017). The structural problem persists: in 2021/22 live-animal exports (US$23.5 million) were worth more than two and a half times meat exports (US$8.87 million) (MINAGRI, 2024; NISR, 2022). Official inspections found that only 7 of 48 slaughterhouses met more than 70% of safety and quality requirements (RICA data as cited in Beautiful Rwanda, 2022), and a 2021 inspection of 44 slaughterhouses found that none of the small operators met the "gold" hygiene standard (Agrilinks, 2022). Transboundary animal diseases such as foot-and-mouth disease, lumpy skin disease, Rift Valley fever and African swine fever further threaten market access (MINAGRI, 2024; Perry & Grace, 2009). Rwanda's landlocked position raises trade costs (Limão & Venables, 2001), and its Logistics Performance Index score declined from 2.97 in 2018 to 2.8 in 2023 (World Bank, 2018, 2023).

International literature links export performance to supply capacity, standards compliance, value-chain upgrading, market access and trade facilitation (Gereffi et al., 2005; Jaffee & Henson, 2004; Portugal-Perez & Wilson, 2012), yet no integrated, data-based study jointly examines these five factors for Rwanda's meat sector over 2017–2026. Existing Rwandan studies focus on production systems and on dairy, poultry, or pig value chains (Mahoro et al., 2017; Munyaneza et al., 2022; Shyaka et al., 2022) rather than on meat export performance. Moreover, because no consistent annual meat export series is published, any such study must be explicit about what the available evidence can and cannot demonstrate. This gap limits evidence-based policy under PSTA5 and the LDS 2024–2029, which seek to reduce imports and increase exports of livestock products. The present study addresses this gap by assembling, verifying, and analysing the documentary evidence within an associational rather than causal framework.

## 1.1 Objectives of the study

### 1.1.1 General objective

The general objective of this study is to analyse the factors associated with meat export performance in Rwanda over the period 2017–2026, with specific reference to livestock production capacity, quality and sanitary standards, value addition, market access and trade facilitation.

### 1.1.2 Specific objectives

**SO1:** To assess the relationship between livestock production capacity and meat export performance in Rwanda.

**SO2:** To examine the relationship between compliance with quality and sanitary standards and meat export market access in Rwanda.

**SO3:** To evaluate the relationship between value addition and meat export value and unit value in Rwanda.

**SO4:** To analyse the relationship between market access and diversification and meat export performance in Rwanda.

**SO5:** To assess the relationship between trade facilitation and logistics performance and meat export performance in Rwanda.

### 1.1.3 Hypotheses of the study

Consistent with the documentary design and the length of the available series, the hypotheses are stated as directional associations rather than causal effects. Each is assessed against the evidence standard defined in Section 3.3.

**H1:** Livestock production capacity is positively associated with meat export performance in Rwanda.

**H2:** Higher compliance with quality and sanitary standards is positively associated with meat export market access.

**H3:** Greater value addition is associated with higher meat export value and unit value.

**H4:** Greater market diversification is associated with improved meat export performance.

**H5:** Improved trade facilitation and logistics performance are associated with increased meat export performance.

# 2. Literature Review

## 2.1 Conceptual review

**Meat export performance.** Export performance is the outcome of a country's or firm's international sales activities and is commonly measured through export value, volume, growth, export intensity, market share and destination diversity (Leonidou et al., 2002; Sousa, 2004; Zou & Stan, 1998). At the national level, meat export performance refers to the value and volume of fresh, chilled, frozen and processed meat (HS chapters 02 and 16) exported, its growth, its share in agricultural exports and the unit value obtained (FAO, 2023).

**Livestock production capacity.** This denotes the ability of a livestock system to generate a surplus of slaughter animals and meat above domestic consumption. It is reflected in herd size, offtake rates, carcass weights, feed availability and animal genetics, and is often summarised through Tropical Livestock Units (TLU) (FAO, 2011; Shapiro et al., 2017). Supply capacity is a necessary, though insufficient, condition for exports (Freund & Rocha, 2011).

**Quality and sanitary standards.** These include sanitary and phytosanitary (SPS) measures under the WTO SPS Agreement, veterinary controls, meat inspection, hygiene practices, traceability and private standards such as HACCP (Henson & Jaffee, 2008; WTO, 1995). Because meat is highly perishable and a vector for zoonoses, compliance with SPS requirements is a precondition for entering formal markets (Thomson et al., 2004).

**Value addition.** Value addition refers to the transformation of live animals into carcasses, primal cuts, chilled or frozen meat and processed products (sausages, cured and packed meat) that capture a higher unit value and retain by-products such as hides and offal domestically (Humphrey & Schmitz, 2002; Kaplinsky & Morris, 2001).

**Market access and trade facilitation.** Market access captures the conditions under which products can enter foreign markets, including tariffs, non-tariff measures, trade agreements (EAC, COMESA, AfCFTA), buyer linkages and market information (Disdier et al., 2008). Trade facilitation refers to the simplification and harmonisation of procedures and the quality of logistics infrastructure, such as customs efficiency, border posts, cold-chain transport and single windows, that reduce the time and cost of trade (Wilson et al., 2003; WTO, 2014).

## 2.2 Theoretical Review

Comparative advantage and factor endowment theory. Ricardian and Heckscher–Ohlin theory predict that countries export goods that use their relatively abundant factors intensively (Ohlin, 1933). Rwanda's endowment of grassland, a large cattle herd, and a pastoral culture suggests a latent comparative advantage in livestock, which can be measured through revealed comparative advantage indices (Balassa, 1965). The theory underpins H1: greater livestock production capacity should be associated with a larger exportable surplus. Porter's Diamond and the resource-based view. Porter (1990) argues that national competitiveness depends on factor conditions, demand conditions, related and supporting industries, and firm strategy, with government as a catalyst. The resource-based view similarly emphasises valuable, rare, and hard-to-imitate resources (Barney, 1991). Abattoirs, cold chains, veterinary services and feed industries constitute the related and supporting industries that underpin H2 and H3. Global value chain (GVC) theory. GVC theory explains how lead firms and standards govern participation and upgrading in international supply chains (Gereffi et al., 2005; Humphrey & Schmitz, 2002). Moving from live animals (low-value commodity trade) to chilled and processed meat is a form of product and functional upgrading, the basis of H3; meeting buyer and regulatory standards is the entry ticket to higher-value chains, the basis of H2 (Maertens & Swinnen, 2009; Swinnen, 2016). Standards-as-catalysts versus standards-as-barriers. Otsuki et al. (2001) show that stringent EU aflatoxin standards reduced African exports, while Jaffee and Henson (2004) argue that standards can act as catalysts for upgrading. This debate frames H2 as an empirical question. Gravity model and new trade theory. The gravity model explains bilateral trade by economic size and trade costs (Anderson & van Wincoop, 2003; Tinbergen, 1962). Trade costs include distance, borders, time, and logistics quality (Djankov et al., 2010; Hummels & Schaur, 2013). Melitz (2003) adds that only productive firms can absorb the fixed costs of exporting. These theories underpin H4 and H5.

## 2.3 Empirical Studies

**Standards and market access (H2, H4).** Otsuki, Wilson and Sewadeh (2001) applied a gravity model to African food exports to the European Union. They found that stricter EU food safety standards significantly reduced African agri-food exports. Disdier, Fontagné and Mimouni (2008) also used a gravity framework, drawing on SPS and TBT notifications. They showed

that such measures reduce agricultural exports from developing countries to OECD markets, which links sanitary standards directly to market access. Jaffee and Henson (2004) offered a more optimistic view based on a case-based review of developing countries' agro-food exports: standards can act as catalysts for upgrading where compliance capacity is built. Rich, Perry and Kaitibie (2009) supported this view for livestock. Using a commodity-based trade model of Ethiopian beef exports, they showed that commodity-based SPS approaches can improve market access for beef. In Rwanda, Shyaka et al. (2022) mapped the pig value chain and found that informal slaughter and weak governance create significant sanitary risks. Trade facilitation (H5). Wilson, Mann and Otsuki (2003) used a gravity model for APEC countries and found that port efficiency, customs performance and the regulatory environment significantly raise trade flows. Djankov, Freund and Pham (2010) applied a difference gravity model to 126 countries. They estimated that each additional day before shipment reduces trade by more than 1%, with time-sensitive goods most affected. Freund and Rocha (2011) used gravity and decomposition methods and identified inland transit time as the most significant constraint on African exports. Portugal-Perez and Wilson (2012) drew on panel data for 101 developing countries and showed that improvements in both soft and hard infrastructure raise export performance. Production capacity and value addition (H1, H3). Legese et al. (2008) analysed Ethiopia's live-animal and meat value chains. They concluded that weak abattoir capacity, informal live-animal trade and SPS gaps jointly limit meat exports, which bears on H1–H3 together. For Rwanda, the Livestock Master Plan (Shapiro et al., 2017) used sector investment modelling to project that investment in red and white meat can generate export surpluses. At the regional level, MINICOM (2016) and Rwanda Today (2020) documented large unmet demand for meat in the DRC. They also found that limited cold storage and transport capacity restrict formal meat exports, a finding relevant to H3–H5.

Taken together, these studies indicate that supply capacity, sanitary compliance, value-chain upgrading, market access and logistics are each associated with livestock and meat export performance. However, they are usually examined separately rather than within a single framework, as this study attempts to do for Rwanda.

## 2.4 Research gap

Four gaps emerge. First, a contextual gap: most export studies focus on coffee, tea, horticulture or aggregate agricultural exports, while Rwandan livestock studies focus on production rather than exports (Shapiro et al., 2017; Shyaka et al., 2022). Second, a conceptual gap: few studies combine supply-side (production capacity, value addition), regulatory (SPS standards) and trade-cost (market access, facilitation) factors within a single framework, although the literature treats them separately (Jaffee & Henson, 2004; Portugal-Perez & Wilson, 2012). Third, a temporal gap: no study covers the post-PSTA4, post-COVID and PSTA5/NST2 period of 2017–2026, during which meat exports surged, and new abattoirs, livestock markets and SPS reforms were introduced (MINAGRI, 2022, 2024). Fourth, a methodological gap: available Rwandan evidence is scattered across ministry, agency and media sources; a systematic, source-verified documentary synthesis that quantifies relationships and states transparently the strength of evidence behind each claim is lacking (Bowen, 2009; Snyder, 2019). This study addresses these gaps within the limits of a documentary design.

## 2.5 Conceptual Framework

The conceptual framework (Figure 1) links five explanatory factors to the outcome, meat export performance, while recognising intervening factors such as policy, climate and disease shocks, and regional security. Each arrow represents

a hypothesised positive association (H1–H5) rather than an estimated causal effect.

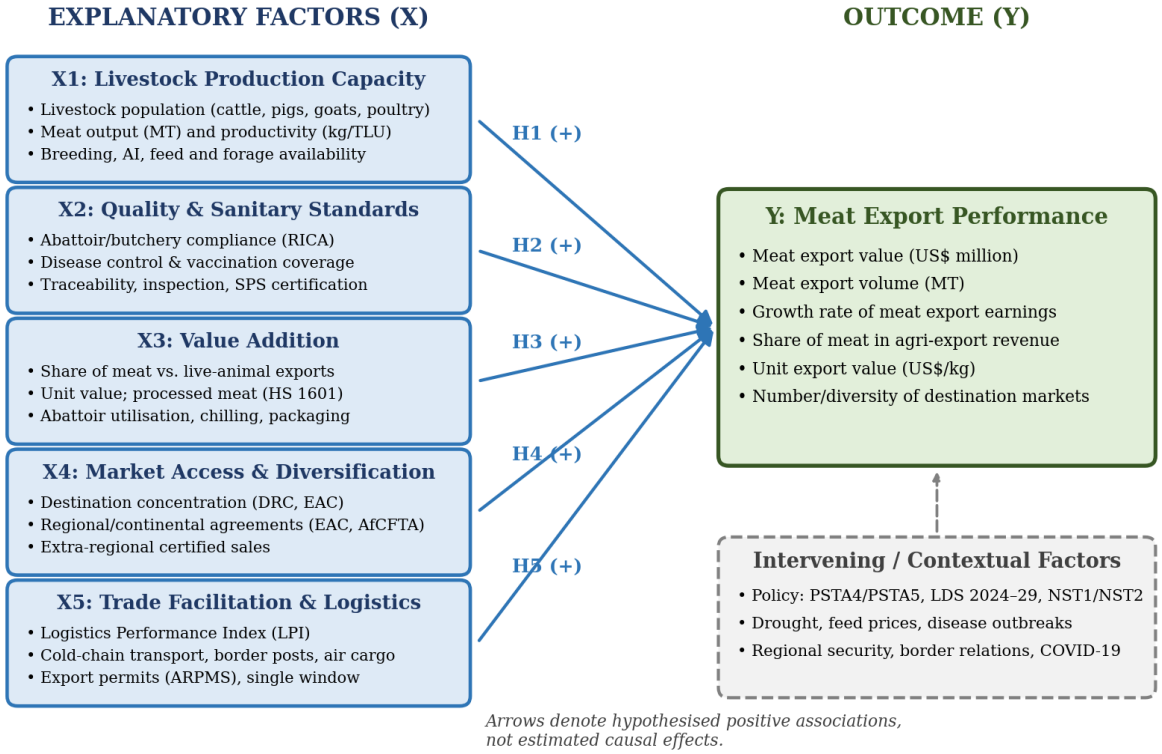


**Figure 1: Conceptual framework of factors associated with meat export performance in Rwanda**

*Source: Author's conceptualisation (2026), adjusted from Porter (1990), Gereffi et al. (2005), Jaffee and Henson (2004) and Portugal-Perez and Wilson (2012).*

Livestock production capacity (X1) conditions the exportable surplus; quality and sanitary standards (X2) condition eligibility for formal markets; value addition (X3) conditions the unit value captured per animal; market access and diversification (X4) condition where and how much can be sold; and trade facilitation (X5) conditions the time and cost of reaching buyers. Meat export performance (Y) is measured by export value, volume, growth, share in agri-exports, unit value and destination diversity.

# 3. Methodology

## 3.1 Research design and data sources

This study adopted a documentary (desk) research design grounded in systematic document analysis, in which existing records are located, appraised and synthesised to generate empirical knowledge (Bowen, 2009; Scott, 1990), combined with quantitative secondary data analysis (Johnston, 2014) within a descriptive and correlational approach (Creswell & Creswell, 2018). The study covered 2017–2026, a period spanning PSTA4, the Livestock Master Plan, NST1 and the first years of PSTA5, NST2 and the LDS 2024–2029. Documents were purposively selected for their authenticity, credibility, representativeness and meaning (Scott, 1990), and included MINAGRI annual reports (2018/19–2022/23), the LDS 2024–2029, NAEB strategic and annual reports (NAEB, 2019, 2024), NISR Statistical Yearbooks and Formal External Trade in Goods reports (2022–2025), RAB and RICA releases, World Bank Logistics Performance Index and Doing Business data, UN Comtrade-based trade databases, peer-reviewed articles and reputable media reports used only to report attributable official data. Data were extracted into a structured matrix by variable, harmonised by fiscal year and cross-checked across at least two sources where possible (Snyder, 2019).

## 3.2 Source verification protocol

Because several statistics reach the public only through secondary channels, each figure was graded by provenance (Table 1). Tier 3 figures were retained only if they were attributed to a named official agency, were consistent in order of magnitude with Tier 1 series, and were flagged in the relevant table note. Where two sources disagreed, the Tier 1 value was used.

**Table 1: Source hierarchy and verification status of key statistics [Linked to all specific objectives, SO1–SO5]**

| Tier | Definition | Key statistics in this study | Treatment |
|---|---|---|---|
| Tier 1 | Official primary publication consulted directly | Livestock population and output (MINAGRI, 2022, 2024); vaccination (MINAGRI); agri-export totals to 2023/24 (NAEB, 2024); LPI (World Bank, 2018, 2023) | Used for all descriptive and inferential analysis |
| Tier 2 | Official data reproduced in another official or database source | 2021/22 livestock export basket (NISR/NAEB via MINAGRI, 2024); HS 02 and HS 1601 exports (UN Comtrade via TrendEconomy, Trading Economics) | Used; original agency cited alongside the reproducing source |
| Tier 3 | Official data reported by reputable media | RICA inspection counts (Beautiful Rwanda, 2022); 2022/23 meat exports (Umutesi, 2024); 2023/24 meat output (Food Business MEA, 2025a); 2025/26 agri-exports (Bantu Gazette, 2026) | Used with attribution; flagged; results relying on them marked as provisional |

***Source: Author's protocol (2026), adapted from Scott (1990) and Bowen (2009).***

## 3.3 Analytical procedures and evidence standard

Descriptive analysis used frequencies, shares, year-on-year growth, and compound annual growth rates. Inferential analysis applied Pearson correlation with Fisher-z 95% confidence intervals and Bonferroni adjustment for multiple comparisons, OLS trend and log-log regressions with a first-difference check for spurious trend correlation, and a chi-square test of independence with Cramér's V and Fisher's exact tests, computed in Python (SciPy) at the 5% level (Gujarati & Porter, 2009). The ratio of export growth to output growth is reported as a descriptive *export-to-output growth ratio*, not as an elasticity, because an elasticity requires estimation over a series of paired observations (Gujarati & Porter, 2009). Missing years were reported as "n.a." rather than imputed.

Because no consistent annual meat export series exists, the inferential tests examine links within each hypothesised chain (for example, cattle stock → meat output, or facility type → compliance) rather than the full factor → export relationship. Each hypothesis was therefore judged against three levels of evidence: Level A (inferential), a statistical test on the relevant variable pair or its closest proxy; Level B (quantified documentary), indicators computed from official series that move in the hypothesised direction; and Level C (qualitative documentary), consistent evidence from official documents and literature. A hypothesis is described as *consistent with the evidence* when Levels B and C agree and no contrary evidence exists; *partially consistent* when evidence supports only one link of the hypothesised chain; and *not established* when evidence is absent or contrary. No hypothesis is described as statistically confirmed, because none of the tests relates a factor directly to export performance.

## 3.4 Supplementary trade statistics and linkage of tables to specific objectives

To extend the export evidence beyond the NAEB and NISR fiscal-year aggregates, the study added customs-recorded trade statistics at the Harmonised System (HS) level for meat and edible meat offal (HS 02), live animals (HS 01) and meat preparations (HS 1601), as reported by Rwanda to UN Comtrade and disseminated through TrendEconomy, the World Bank's World Integrated Trade Solution (WITS) and Trading Economics (Tier 2).

These series are recorded by calendar year and product code, whereas NAEB reports by fiscal year and product category, so the two are presented side by side rather than merged. Partner-level records were used to identify destinations and, where published, quantities. Evidence for the years after 2022/23 was drawn from the NAEB Annual Report 2023–2024 (Tier 1), the NAEB statement on 2025/26 export revenue and NAEB weekly export bulletins reported in the media (Tier 3). Unit values were computed by the author as export value divided by quantity. So that every statistic serves the purpose of the study, each table and figure is linked to one or more specific objectives (SO1–SO5) and to the corresponding hypothesis (Table 2). The link is also stated in square brackets in each table and figure caption.

**Table 2: Linkage of statistical tables and figures to the specific objectives and hypotheses [Linked to SO1–SO5]**

| Specific objective | Hypothesis | Tables | Figures | Principal indicators |
|---|---|---|---|---|
| SO1: Livestock production capacity | H1 | Tables 3, 4, 5, 22, 23 and 25 | Figure 2 | Herd size by species, TLU, meat output, target attainment, per-capita consumption, export intensity |
| SO2: Quality and sanitary standards | H2 | Tables 6, 7, 15, 16 and 24 | – | Facility compliance, vaccination coverage, traceability, certified extra-regional shipments |
| SO3: Value addition | H3 | Tables 8, 9, 10, 11 and 25 | Figures 3 and 4 | Live-animal versus meat values, HS product composition, processed-meat exports, unit values (US$/kg) |

| Specific objective | Hypothesis | Tables | Figures | Principal indicators |
|---|---|---|---|---|
| SO4: Market access and diversification | H4 | Tables 12, 13, 14, 15, 16, 17, 18, 19 and 25 | Figures 5 and 6 | Meat export value by source, share in agri-exports, destinations, trade balance, livestock-product exports |
| SO5: Trade facilitation and logistics | H5 | Tables 20, 21 and 25 | – | LPI, re-export share, packhouse throughput, air-cargo and cold-chain indicators |
| Cross-cutting | H1–H5 | Tables 1 and 26 | Figure 1 | Source verification; synthesis of evidence |

*Source: Author's compilation (2026).*

## 4. Results and Discussion

### 4.1 Descriptive statistics

#### 4.1.1 Livestock production capacity

**Table 3: Livestock population in Rwanda by species, 2017–2022/23 (heads) [Linked to SO1]**

| Species | 2017 | 2018 | 2019 | 2020 | 2021 | 2022/23 | Change (%) |
|---|---|---|---|---|---|---|---|
| Cattle | 1,166,187 | 1,293,768 | 1,371,828 | 1,449,888 | 1,575,703 | 1,644,692 | +41.0 |
| Goats | 2,923,706 | 2,731,795 | 2,387,898 | 2,844,001 | 2,348,895 | 1,995,636 | −31.7 |
| Sheep | 664,703 | 601,836 | 541,416 | 601,836 | 501,548 | 440,214 | −33.8 |
| Pigs | 1,716,438 | 1,330,461 | 1,385,769 | 1,441,077 | 1,498,721 | 1,123,075 | −34.6 |
| Rabbits | 1,347,860 | 1,264,734 | 688,788 | 801,490 | 817,519 | 656,153 | −51.3 |
| Poultry | 5,272,725 | 5,442,152 | 5,306,254 | 5,442,152 | 5,496,574 | 6,047,215 | +14.7 |
| **Total TLU*** | **1,351,428** | **1,313,408** | **1,315,950** | **1,420,180** | **1,435,781** | **1,357,580** | **+0.5** |

*Source: MINAGRI (2022), Annual Report 2021–2022, Table 16; MINAGRI (2024), LDS 2024–2029, citing Annual Report 2022–2023 (Tier 1). *Tropical Livestock Units computed by the author using FAO (2011) Sub-Saharan conversion factors (cattle 0.5; pigs 0.2; goats and sheep 0.1; poultry and rabbits 0.01).*

Table 3 shows a clear divergence in herd dynamics. Cattle, the principal source of red meat, grew by 41.0% from 1.17 million to 1.64 million head (CAGR ≈ 7.1%), supported by Girinka, artificial insemination (110,495 cows inseminated in 2021/22), and cattle registration (MINAGRI, 2022). Poultry grew by 14.7%. In contrast, goats (−31.7%), sheep (−33.8%), pigs (−34.6%) and rabbits (−51.3%) declined; the fall in pigs in 2022/23 is attributed to African swine fever, swine erysipelas and leptospirosis outbreaks (MINAGRI, 2024). Total livestock biomass in TLU was therefore nearly flat (+0.5%), implying that growth in meat supply has come mainly from cattle and from higher productivity rather than from an expanding total herd. The decline of small ruminants matters for exports because goats and sheep are the species most traded to regional and Middle Eastern markets.

**Table 4: Production of livestock products and meat output growth, 2017–2023/24 [Linked to SO1]**

| Year | Meat (MT) | Meat growth (%) | Milk (MT) | Eggs (MT) | Hides & skins (MT) | Meat per capita (kg/yr) | % of PSTA4 meat target |
|---|---|---|---|---|---|---|---|
| 2017 | 152,029 | – | 816,791 | 7,475 | 6,781 | 12.7 | 70.7 |
| 2018 | 162,470 | 6.87 | 847,178 | 7,936 | 6,567 | 14.06 | 75.5 |
| 2019 | 168,687 | 3.83 | 864,252 | 7,972 | 6,305 | 14.06 | 78.4 |
| 2020 | 174,904 | 3.69 | 891,326 | 8,272 | 6,305 | 14.5 | 81.3 |
| 2021 (2021/22) | 185,989 | 6.34 | 999,976 | 8,665 | 6,087 | 13.9 | 86.5 |
| 2022/23 | 197,778 | 6.34 | 1,061,301 | 17,344** | 6,027 | 13.2 | 92.0 |
| 2023/24 | 207,097† | 4.71 | n.a. | n.a. | n.a. | n.a. | 96.3 |
| 2028/29 (target) | 247,223 | CAGR 3.6 | – | – | – | – | PSTA5 target |

*Source: MINAGRI (2022), Tables 17–18; MINAGRI (2024), LDS 2024–2029 (Tier 1); †RAB data reported in Food Business MEA (2025a) and The Farmer's Journal Africa (2025) (Tier 3). PSTA4 target = 215,058 MT; percentages computed by the author. **Change in egg-reporting method in 2022/23.*

Meat output grew every year, from 152,029 MT in 2017 to 207,097 MT in 2023/24, a cumulative increase of 36.2% and a CAGR of 5.3%. Annual growth ranged between 3.7% and 6.9%. Target attainment rose from 70.7% to 96.3% of the PSTA4 target; the 2023/24 shortfall was attributed by RAB to prolonged drought and high maize and soybean feed costs (Food Business MEA, 2025a). Per-capita meat consumption stabilised at about 13–14.5 kg per year, meaning that most of the additional output was absorbed by a growing population of 13.2 million (NISR, 2023). The exportable surplus is therefore thin, and the PSTA5 target of 247,223 MT by

2028/29 implies only 3.6% annual growth, below recent performance. Rwanda's production capacity appears sufficient to support modest, niche exports, but a structural export surplus is likely to require productivity gains, particularly through beef fattening, feedlots, and pig and poultry intensification.

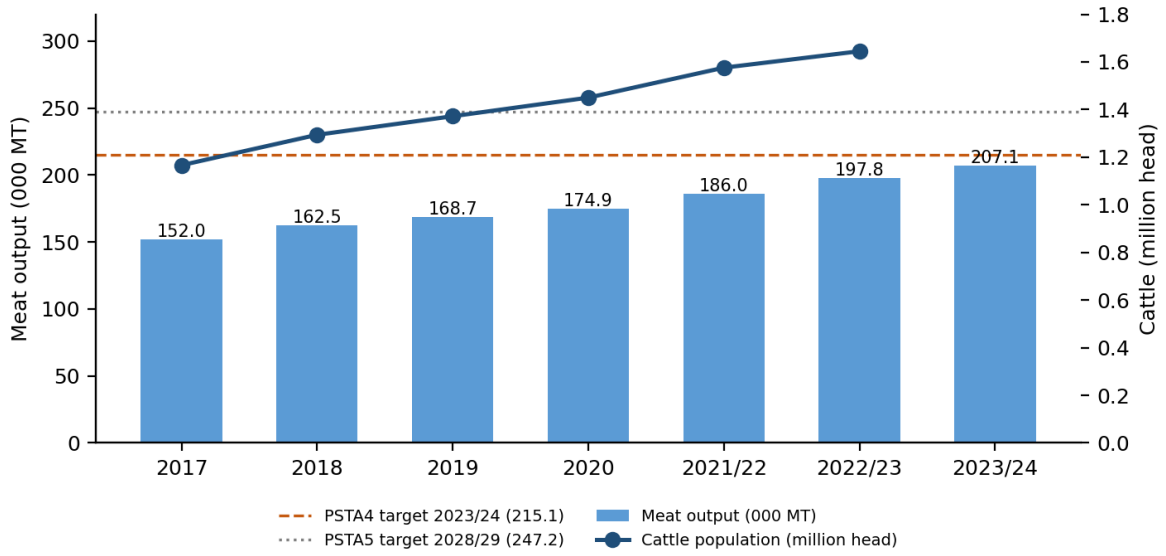


**Figure 2: Meat output, cattle population and PSTA targets, 2017–2023/24 [Linked to SO1]**

*Source: Author's construction from Table 4 (MINAGRI, 2022, 2024; RAB data in Food Business MEA, 2025a) and Table 3 (MINAGRI, 2022, 2024). Cattle numbers for 2023/24 had not been published at the time of writing.*

Figure 2 shows that meat output rose in every year and closed most of the gap to the PSTA4 target, while the cattle herd grew in parallel up to 2022/23. The distance between the 2023/24 level and the PSTA5 target of 247,223 MT (about 40,100 MT) is roughly seven times the meat volume exported in 2021/22 (5,485 MT), indicating that the planned expansion of output is large relative to current export volumes, although population growth will absorb part of it.

**Table 5: Domestic demand and supply benchmarks relevant to the exportable meat surplus, 2021/22–2028/29 [Linked to SO1]**

| Indicator | Value | Period | Source |
|---|---|---|---|
| Meat output | 185,989 MT → 207,097 MT | 2021/22–2023/24 | MINAGRI (2024); RAB data in Food Business MEA (2025a) |
| Meat output target under PSTA5 | 247,223 MT (+19.4% on 2023/24) | 2028/29 | RAB data in Food Business MEA (2025a) |
| Recorded meat export volume and export intensity | 5,485 MT (2.95% of output) | 2021/22 | NISR (2022); NAEB via MINAGRI (2024) |
| Per-capita meat consumption, Rwanda | 14.8 kg per person per year | 2025 (reported) | RAB in Food Business MEA (2025a) |
| Per-capita meat consumption, global average (benchmark) | 43 kg per person per year | 2025 (reported) | RAB in Food Business MEA (2025a) |
| Retail price of beef, Rwanda | US$4.60–5.40 per kg | 2025 | Food Business MEA (2025a) |
| Retail price of chicken, Rwanda | US$2.70–3.10 per kg | 2025 | Food Business MEA (2025a) |
| Projected poultry meat production | 100,000 MT | 2027 | LVVN (2024) |
| Population (base for per-capita demand) | 13.2 million | 2022 | NISR (2023) |

*Source: Compiled by the author from the documents indicated (2026); export intensity and target increment computed by the author. Figures from media reports of RAB data are Tier 3.*

Table 5 places the export question in its demand context. At 14.8 kg per person per year, Rwandan meat consumption is about one-third of the global average, and domestic retail beef prices (US$4.60–5.40/kg) are well above the average unit value of exported meat (US$1.62/kg; Table 8), even allowing for retail margins. At current quality levels the domestic market therefore competes strongly with exports for the available supply, so a larger exportable surplus is likely to depend on output growing faster than domestic demand, as envisaged by the PSTA5 target and the projected expansion of poultry meat.

### 4.1.2 Quality and sanitary standards

**Table 6: Safety and quality compliance of meat facilities in Rwanda [Linked to SO2]**

| Inspection/indicator | Facilities assessed | ≥70% compliance | 50–69% compliance | <50% compliance | Key observation |
|---|---|---|---|---|---|
| RICA inspection of slaughterhouses (2022) | 48 | 7 (14.6%) | 20 (41.7%) | 21 (43.8%) | Only 1 in 7 near compliance |
| RICA inspection of butcheries (2022) | 159 | 15 (9.4%) | 105 (66.0%) | 39 (24.5%) | Majority in grace period |
| Government inspection, slaughterhouses & retail (2021) | 44 slaughterhouses; 152 shops | 27% of medium/large met "gold" | 90% of facilities in "grey" band | 0% of small operators met "gold" | Poor handling, records, pest and waste control |
| RALIS survey of Kigali butcheries (2017) | 114 | 65% met ~70% of requirements | – | – | Baseline before RICA |

*Source: RICA data reported in Beautiful Rwanda (2022) (Tier 3); Agrilinks (2022); Food Safety Africa (2023). Percentages computed by the author.*

Table 6 reveals a major sanitary bottleneck. Only 14.6% of inspected slaughterhouses and 9.4% of butcheries achieved at least 70% compliance, while 43.8% of slaughterhouses scored below 50%. The 2021 inspection found that none of the small operators met the gold standard. These deficits, linked to backyard and home slaughtering, weak record-keeping, poor cold chains and inadequate waste management, mean that the bulk of Rwandan meat is unlikely to satisfy the certification demanded by formal regional supermarkets, the Middle East or other premium markets. Government responses, including the 2023 ban on selling unrefrigerated meat, closure of substandard abattoirs and RICA's planned seal of approval, signal a shift towards standards-as-catalysts (Jaffee & Henson, 2004).

**Table 7: Animal disease control and traceability indicators, 2021/22–2022/23 [Linked to SO2]**

| Indicator | 2021/22 | 2022/23 | Change (%) |
|---|---|---|---|
| Cattle vaccinated against foot-and-mouth disease (FMD) | 219,024 | 261,184 | +19.2 |
| Cattle vaccinated against lumpy skin disease (LSD) | 777,799 | 1,331,633 | +71.2 |
| Cattle vaccinated against black quarter (BQ)/anthrax | 655,367 | 759,728 | +15.9 |
| Cattle vaccinated against brucellosis | 61,296 | 81,638 | +33.2 |
| Cattle vaccinated against Rift Valley fever (RVF) | 1,203,749 | 1,267,970 | +5.3 |
| Cattle ear-tagged and registered (cumulative) | 1,417,328 | n.a. | – |
| Cows/poultry/pigs insured | 24,144 / n.a. / n.a. | 48,962 / 274,506 / 7,300 | +102.8 (cows) |
| Veterinary laboratories (central + satellite) | 5 | 5 | 0.0 |

*Source: MINAGRI (2022), Annual Report 2021–2022; MINAGRI (2024), LDS 2024–2029 citing Annual Report 2022–2023 (Tier 1). Changes computed by the author.*

Animal health efforts intensified. LSD vaccination rose by 71.2%, and FMD vaccination by 19.2%, and 1.42 million cattle were ear-tagged, strengthening traceability, a key requirement in SPS certification. However, FMD coverage of 261,184 head represents only about 16% of the national cattle herd of 1.64 million, a level insufficient to support the FMD-free zone status that premium beef importers require (Thomson et al., 2004). The 2022 RVF outbreak and the 2022/23 African swine fever episode illustrate how disease shocks can abruptly disrupt export supply and trigger trade restrictions.

#### 4.1.3 Value addition

**Table 8: Rwanda's livestock and livestock-product export basket, 2021/22 [Linked to SO3]**

| Product | Quantity | Value (US$) | Share of basket (%) | Unit value |
|---|---|---|---|---|
| Meat | 5,485,017 kg | 8,873,580 | 20.5 | US$1.62/kg |
| Milk | 12,432,764 litres | 8,064,676 | 18.6 | US$0.65/litre |
| Hides and skins | 3,719,395 kg | 2,878,507 | 6.6 | US$0.77/kg |
| Live cattle | 43,861 head | 12,401,341 | 28.6 | US$282.7/head |
| Live pigs | 69,473 head | 5,703,759 | 13.2 | US$82.1/head |
| Live goats | 80,505 head | 2,876,768 | 6.6 | US$35.7/head |
| Live sheep | 14,582 head | 410,452 | 0.9 | US$28.1/head |
| Live poultry | 581,306 head | 2,128,239 | 4.9 | US$3.7/head |

| Product | Quantity | Value (US$) | Share of basket (%) | Unit value |
|---|---|---|---|---|
| **Total live animals** | – | **23,520,559** | **54.3** | – |
| **Total basket** | – | **43,337,322** | **100.0** | – |

*Source: NISR (2022), Rwanda Statistical Yearbook; NAEB, Agricultural Export Performance 2021–2022, as reported in MINAGRI (2024), LDS 2024–2029 (Tier 2). Shares and unit values computed by the author.*

Table 8 is central to H3. Live animals accounted for 54.3% of the livestock export basket, compared with 20.5% for meat. Rwanda exported 43,861 live cattle worth US$12.4 million, more than the entire meat export value. This pattern transfers the value of slaughtering, chilling, cutting, packaging and by-products (hides, offal, bones) to the importing country, principally the DRC. The low average meat unit value (US$1.62/kg) suggests that most exported meat is fresh, unbranded carcass meat sold across the border rather than graded, vacuum-packed cuts. The NAEB 2023/24 report shows that live animals remained the second-largest diversified direct export at US$45.55 million (NAEB, 2024), roughly double the meat export value of 2022/23.

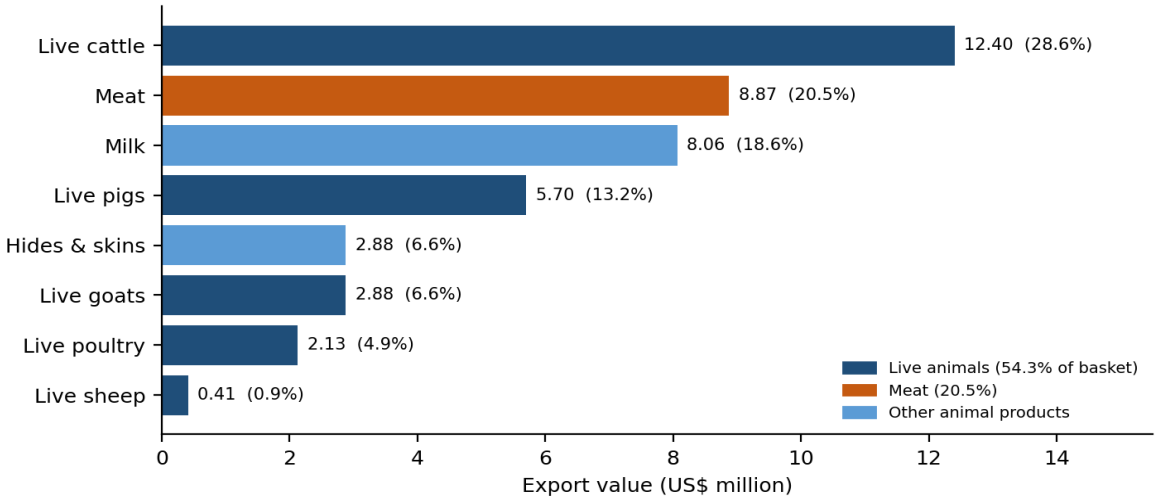


**Figure 3: Composition of Rwanda's livestock and livestock-product export basket by value, 2021/22 [Linked to SO3]**

*Source: Author's construction from Table 8 (NISR, 2022; NAEB via MINAGRI, 2024).*

Figure 3 makes the value-addition gap visible: live cattle alone earned more than all meat exports, and the four live-animal categories together accounted for more than half of the basket.

**Table 9: Meat processing and value-addition infrastructure indicators, 2017–2026 [Linked to SO3]**

| Indicator | Status/value | Year | Source |
|---|---|---|---|
| Abattoir installed capacity vs. live cattle exported to DRC | Capacity sufficient to slaughter >30,000 cows/month exported live | 2016–2017 | MINICOM (2016); MINAGRI (2017) |
| Pig slaughter slabs under construction (10 districts) | 50% physical progress; Rwf1.4 billion programme | 2021/22 | MINAGRI (2022); allAfrica (2022) |
| District livestock markets (15 new) | 50% physical progress | 2021/22 | MINAGRI (2022) |
| Nyabugogo abattoir chilling capacity | Cold rooms for 50 and 100 cows; third for 200 cows planned | 2023 | Food Safety Africa (2023) |
| Gakenke slaughterhouse utilisation | Operating at about 30% of capacity | 2024 | allAfrica (2024) |
| Gako Meat Company (PPP feedlot) | ~5,000 cows; target 56,000 in feedlots, 86,400 slaughtered/yr | 2023/24 | MINAGRI (2024) |
| Formal processed meat exports to DRC (project baseline and target) | 80,364 kg (2019) → target 150,000 kg by 2022 | 2019–2022 | Rwanda Today (2020) |
| Sausages and meat preparations exports (HS 1601) | About US$29,000, 100% to DRC | 2022 | TrendEconomy (2023) (UN Comtrade) |

*Source: Compiled by the author from the documents indicated (2026).*

Table 9 suggests that installed slaughter capacity is not the binding constraint; rather, underutilisation (Gakenke at 30%), illegal home slaughter, limited chilling capacity, and weak investment in further processing are.

Exports of processed meat preparations (HS 1601) were negligible at about US$29,000 in 2022, indicating that Rwanda exports almost no branded or processed meat products. Public investments in pig slaughter slabs, livestock markets and PPP feedlots such as Gako Meat Company are steps toward upgrading, but their association with export outcomes cannot yet be observed in the data.

**Table 10: Customs-recorded exports of live animals, meat and meat preparations by HS code, 2021–2022 (US$) [Linked to SO3 and SO4]**

| HS code and product | 2021 | 2022 | Change (%) | Main recorded destinations (2022) |
|---|---|---|---|---|
| **HS 01 Live animals (chapter total)** | **9,230,000** | **8,230,000** | **−10.8** | **DRC (US$8.09 million of live animals)** |
| **HS 02 Meat and edible meat offal (chapter total)** | **1,950,000** | **3,910,000** | **+100.5** | **China, Hong Kong, DRC and other regional partners** |
| of which 0202 Bovine meat, frozen (to China) | 113,600* | 122,840 | – | China |
| of which 0210 Meat salted, dried or smoked | n.a. | 191,020 | – | China (106,330); Hong Kong (84,690) |
| of which 0206 Edible offal | n.a. | 25,140 | – | Hong Kong |
| of which 0209 Pig and poultry fat | 24,576 | 4,587 | −81.3 | DRC (57%); Tanzania (42%) |
| of which 0204 Sheep and goat meat | n.a. | 4,500 | – | DRC (100%) |
| **HS 1601 Sausages and similar meat products** | **8,626** | **29,998** | **+247.7** | **DRC (100%)** |
| HS 16 Meat and fish preparations (chapter total) | 2,580,000 | 3,870,000 | +50.0 | n.a. |
| Ratio of live-animal to meat exports (HS 01 : HS 02) | 4.73: 1 | 2.10 : 1 | – | – |
| HS 02 share of total merchandise exports (%) | 0.13 | 0.19 | – | Total exports US$1.56 bn (2021) and US$2.01 bn (2022) |

*Source: UN Comtrade (Rwanda as reporter) via TrendEconomy (2023, 2024), World Bank (2024a) and Trading Economics (2026, 2026b) (Tier 2). Changes, ratios and shares computed by the author. Sub-heading values are partner-specific records and do not sum to the chapter total; n.a. = not available in the consulted databases. *Sub-heading 020230 (frozen boneless bovine meat) only: 25,120 kg shipped to China in 2021.*

Table 10 adds the customs-recorded, product-level picture. Rwanda-reported HS 02 exports doubled from about US$1.95 million in 2021 to US$3.91 million in 2022, yet live-animal exports (HS 01) were still 2.1 times larger in 2022, confirming at the HS level the value-addition gap shown in Table 8. Exports of sausages and similar products (HS 1601) rose from US$8,626 to about US$30,000, entirely to the DRC, but remained equivalent to less than 1% of HS 02 exports. The extra-regional shipments consisted of frozen bovine meat, salted or dried meat and offal, indicating that the more processed and certified lines are those that reach distant markets. HS 02 accounted for less than 0.2% of Rwanda's total merchandise exports.

**Table 11: Unit values of exported meat compared with other products and domestic prices (US$/kg) [Linked to SO3]**

| Product and market | Unit value (US$/kg) | Index (average exported meat = 1.00) | Source |
|---|---|---|---|
| Hides and skins exported, 2021/22 | 0.77 | 0.48 | NISR (2022); NAEB via MINAGRI (2024) |
| Average meat exported, 2021/22 | 1.62 | 1.00 | NISR (2022); NAEB via MINAGRI (2024) |
| Retail chicken, Rwanda, 2025 | 2.70–3.10 | 1.67–1.91 | Food Business MEA (2025a) |
| Frozen boneless bovine meat exported to China (HS 020230), 2021 | 4.52 | 2.79 | World Bank (2024a) |
| Retail beef, Rwanda, 2025 | 4.60–5.40 | 2.84–3.33 | Food Business MEA (2025a) |
| Estimated additional earnings from exporting meat instead of live animals | ≈ 7.00 (premium per kg) | – | MINAGRI (2017) |

*Source: Compiled by the author from the documents indicated (2026); unit values and indices computed by the author. Retail prices include domestic distribution margins and are shown only as benchmarks.*

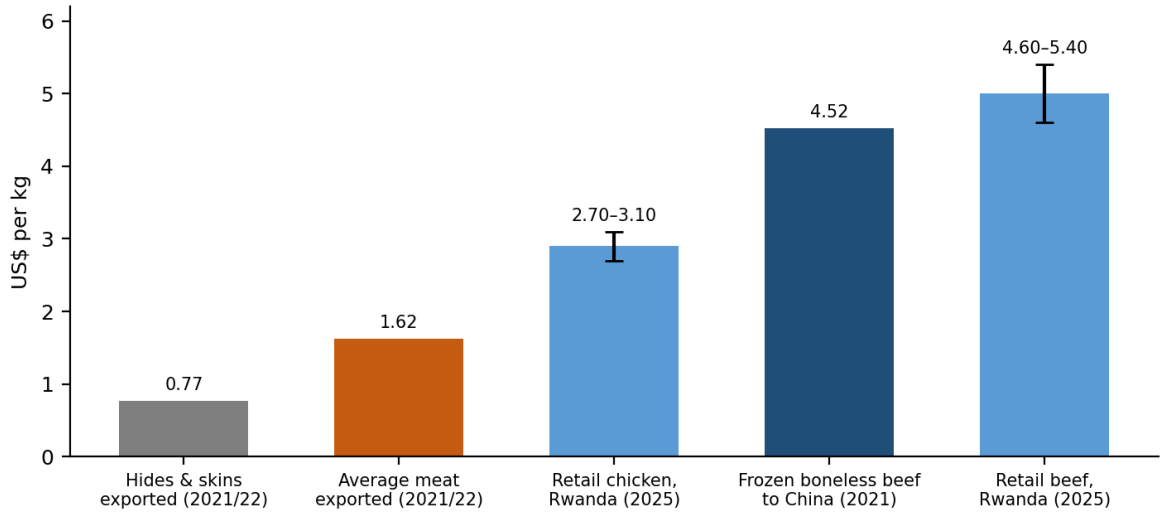


**Figure 4: Unit-value ladder for Rwandan meat and related products (US$/kg) [Linked to SO3]**

*Source: Author's construction from Table 11. Bars for retail prices show the midpoint; error bars show the reported range.*

Certified frozen boneless beef shipped to China earned about US$4.52 per kilogram in 2021, 2.8 times the average unit value of all exported meat in 2021/22 (US$1.62/kg) and close to domestic retail beef prices (Table 11; Figure 4). This premium is consistent with H3: when meat is deboned, frozen, packed and certified, its unit value rises sharply, whereas the bulk of exports, sold as fresh carcass meat across the border, earn less per kilogram than chicken retails for in Rwanda.

### 4.1.4 Meat export performance and market access

**Table 12: Meat export performance indicators, 2014–2023/24 [Linked to SO4]**

| Period | Meat export value (US$ million) | Volume | Growth (%) | Share of agri-exports (%) | Remarks |
|---|---|---|---|---|---|
| 2014 | 7.7 | n.a. | – | n.a. | Pre-study baseline |
| 2015 | 9.3 | n.a. | +20.8 | n.a. | Pre-study baseline |
| 2017/18–2020/21 | n.a. (not separately published) | Formal processed meat to DRC: 80,364 kg (2019) | – | n.a. | COVID-19 border restrictions 2020–21 |
| 2021/22 | 8.87 | 5,485 MT | – | 1.38 | Post-COVID recovery |
| 2022/23 | 22.30† | n.a. | +151.4 | 2.60 | Record meat exports |
| 2023/24 | n.a. | n.a. | – | – | Diversified exports −1.31%; live animals US$45.55m |

*Source: Down to Earth (2016) citing MINICOM; Rwanda Today (2020); NISR (2022) and NAEB via MINAGRI (2024) (Tier 2); †NAEB data reported by Umutesi (2024) (Tier 3); NAEB (2024). Growth and shares computed by the author using agricultural export totals in Table 13.*

Meat export earnings were in the range of US$7.7–9.3 million in 2014–2015 and stood at US$8.87 million in 2021/22, before rising sharply to US$22.3 million in 2022/23, a 151.4% increase. Even at this peak, meat represented only 2.6% of agricultural export earnings. The absence of a separately published meat series for 2017/18–2020/21 is itself a finding: meat has been reported within the aggregated "diversified/animal products" category, reflecting its marginal status and constraining any time-series test of the hypotheses. The broader category of live animals and animal products more than doubled from US$57.7 million in 2021 to US$124 million in 2022 (NAEB data as cited in allAfrica, 2023), indicating strong regional demand.

**Table 13: Rwanda's agricultural export revenues and the relative position of meat, 2017/18–2025/26 [Linked to SO4]**

| Fiscal year | Agri-export revenue (US$ million) | Annual growth (%) | Meat exports (US$ million) | Meat share (%) |
|---|---|---|---|---|
| 2017/18 | 515.9 | – | n.a. | n.a. |
| 2018/19 | 465.4 | −9.8 | n.a. | n.a. |
| 2019/20 | 419.0 | −10.0 | n.a. | n.a. |
| 2020/21 | 444.8 | +6.2 | n.a. | n.a. |
| 2021/22 | 640.9 | +44.1 | 8.87 | 1.38 |
| 2022/23 | 857.2 | +33.7 | 22.30 | 2.60 |
| 2023/24 | 839.2 | −2.1 | n.a. | n.a. |
| 2024/25 | 893.0 | +6.4 | n.a. | n.a. |
| 2025/26 | 1,100.0† | +23.2 | n.a. | n.a. |
| **CAGR 2017/18–2025/26** | **9.9%** | – | – | – |

*Source: MINAGRI (2022); NAEB (2024) (Tier 1); Agri4Africa (2024); †Bantu Gazette (2026) citing NAEB (Tier 3). Growth rates, shares, and CAGR computed by the author.*

Agricultural exports more than doubled from US$515.9 million to US$1.1 billion (CAGR 9.9%), recovering strongly after the 2018/19–2019/20 decline and COVID-19. Meat's share remained below 3% even in its best year, indicating that meat has not yet become a pillar of Rwanda's export diversification despite a favourable overall agri-export environment. This contrast suggests that meat-specific constraints (sanitary compliance, value addition and logistics), rather than general export conditions, are more likely to account for the modest performance.

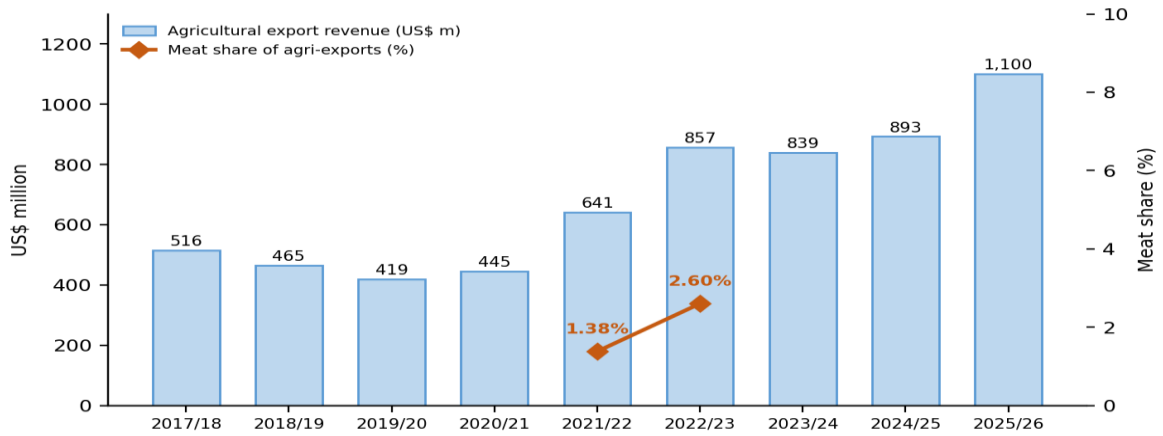


**Figure 5: Agricultural export revenue and the share of meat, 2017/18–2025/26 [Linked to SO4]**

*Source: Author's construction from Table 13 (MINAGRI, 2022; NAEB, 2024; Agri4Africa, 2024; Bantu Gazette, 2026). The meat share is shown only for the years in which a separate meat value is published.*

**Table 14: Rwanda's meat export value by data source and reporting basis, 2014–2025/26 [Linked to SO4]**

| Period | NAEB/MINICOM meat exports (US$ million; fiscal year) | UN Comtrade HS 02 exports, Rwanda-reported (US$ million; calendar year) | UN Comtrade HS 02 imports (US$ million) | Remarks |
|---|---|---|---|---|
| 2014 | 7.7 | n.a. | n.a. | MINICOM baseline |
| 2015 | 9.3 | n.a. | n.a. | MINICOM baseline |
| 2017/18–2020/21 | n.a. | n.a. | n.a. | Meat not published separately; partner-level records only (Table 16) |
| 2021/22 (CY 2021) | 8.87 | 1.95 | 2.02 | NAEB/NISR value ≈ 4.5 times the HS 02 value |
| 2022/23 (CY 2022) | 22.30† | 3.91 | 5.97 | NAEB value ≈ 5.7 times the HS 02 value |
| 2023/24 | n.a. | n.a. | n.a. | Diversified exports −1.31%; live animals US$45.55 million (direct exports) |

| Period | NAEB/MINICOM meat exports (US$ million; fiscal year) | UN Comtrade HS 02 exports, Rwanda-reported (US$ million; calendar year) | UN Comtrade HS 02 imports (US$ million) | Remarks |
|---|---|---|---|---|
| 2024/25 | n.a. | n.a. | n.a. | Total agri-exports US$893.0 million |
| 2025/26 | n.a. | n.a. | n.a. | Livestock products US$204.79 million (all livestock products, not meat alone) |

*Source: Down to Earth (2016) citing MINICOM; NISR (2022) and NAEB via MINAGRI (2024) (Tier 2); †NAEB data reported by Umutesi (2024) (Tier 3); UN Comtrade via TrendEconomy (2024) (Tier 2); NAEB (2024) (Tier 1); NAEB statement reported in Umunota (2026e) (Tier 3). Ratios computed by the author; fiscal and calendar years are not strictly comparable.*

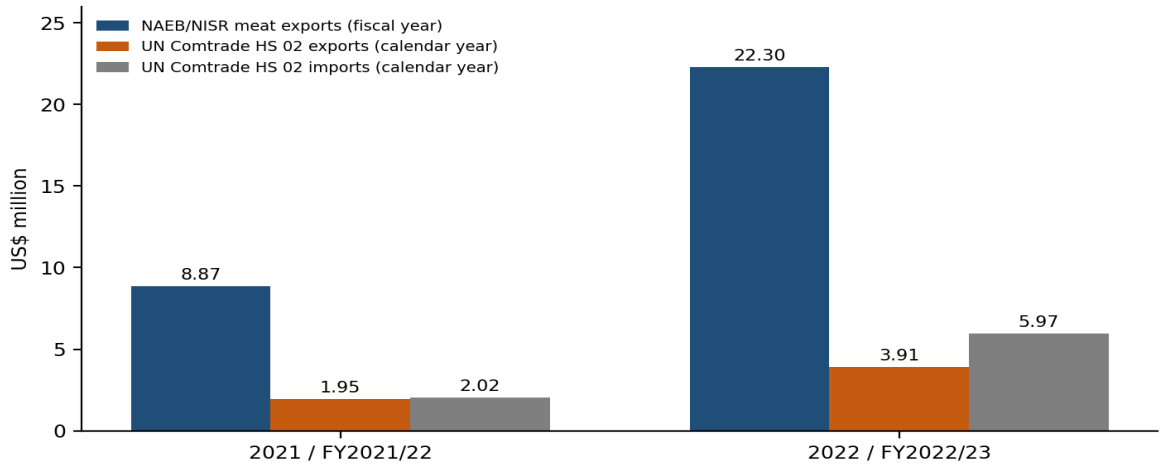


**Figure 6: Meat export and import values by source and reporting basis, 2021–2022 [Linked to SO4]**

*Source: Author's construction from Table 14.*

Figure 5 shows that meat's share remained marginal even as total agricultural exports more than doubled, and Table 14 with Figure 6 reveals a large gap between the two recording systems. The NAEB/NISR meat value for 2021/22 was about 4.5 times the Rwanda-reported HS 02 value for calendar 2021, and the 2022/23 value was about 5.7 times the 2022 HS 02 value. Part of the gap reflects different reference periods and product coverage; other possible explanations include consignments recorded under simplified cross-border regimes and meat products classified outside HS 02. Either way, customs-classified meat exports are much smaller than the headline figures, and on a customs basis Rwanda was a net importer of meat in both 2021 and 2022 (Table 17). Because no meat series has been published after 2022/23, the trend for 2023/24–2025/26 cannot be established from official sources, although livestock products as a whole earned US$204.79 million in 2025/26 (Table 18).

**Table 15: Market access indicators for Rwandan meat and livestock products [Linked to SO4 and SO2]**

| Indicator | Evidence | Source |
|---|---|---|
| Destination concentration | More than 90% of diversified agri-exports (incl. livestock products) go to neighbouring/EAC countries | NAEB (2024) |
| Principal meat and live-cattle market | DRC (Goma, Bukavu); >30,000 cattle per month exported live | MINICOM (2016); MINAGRI (2017) |
| Border demand pressure | Kamembe abattoir handles 50 cows/day against demand of up to 100; 80% goes to Bukavu | Rwanda Today (2020) |
| Extra-regional meat markets | HS 02 exports to China US$229,170; Hong Kong US$109,830 (2022) | Trading Economics (2026) (UN Comtrade) |
| Trade agreements | EAC Common Market, COMESA FTA, AfCFTA (ratified 2018; trading since 2021) | African Union (2018); EAC (2010) |
| Overall export destinations (Q2 2024) | UAE, DRC, China, Luxembourg, UK are top five | NISR (2024) |
| Regional diversification | Domestic exports to SADC +51.45% y/y (Q3 2025) | NISR (2025) |
| SPS reciprocity | Rwanda lifted eight-year ban on South African meat and agri imports (2025) | Food Business MEA (2025b) |

*Source: Compiled by the author from the documents indicated (2026).*

Rwanda's meat exports depend overwhelmingly on proximity markets, especially eastern DRC, where demand is large and SPS requirements are less stringent. This provides volume but also exposes exports to political and security shocks along the Rwanda–DRC border. Small but symbolically important sales to China and Hong Kong show that extra-regional access is possible where certification is achieved. AfCFTA and EAC membership provide tariff-free access, but non-tariff measures, especially SPS, remain the effective barrier (Disdier et al., 2008).

**Table 16: Customs-recorded extra-regional destinations of Rwandan meat exports (HS 02), 2018–2022 [Linked to SO2 and SO4]**

| Year | Destination | Product (HS code) | Value (US$) | Quantity | Source |
|---|---|---|---|---|---|
| 2018 | China | Bovine meat, fresh or chilled (0201) | 100,680 | n.a. | Trading Economics (2026) |
| 2019 | Viet Nam | Meat and edible meat offal (02) | 524,960 | n.a. | Trading Economics (2026b) |
| 2020 | Hong Kong, China | Bovine meat, frozen (0202) | 131,180 | n.a. | Trading Economics (2026) |
| 2021 | China | Bovine meat, frozen, boneless (020230) | 113,600 | 25,120 kg | World Bank (2024a) |
| 2022 | China | HS 02: frozen bovine meat 122,840; salted or dried meat 106,330 | 229,170 | n.a. | Trading Economics (2026) |
| 2022 | Hong Kong, China | HS 02: salted or dried meat 84,690; edible offal 25,140 | 109,830 | n.a. | Trading Economics (2026) |
| **2022** | **China and Hong Kong** | **Share of total HS 02 exports (US$3.91 million)** | **339,000 (8.7%)** | **–** | **Author's computation** |
| **2022** | **Other partners (residual)** | **Regional markets, principally the DRC (Table 10)** | **≈ 3,571,000 (91.3%)** | **–** | **Author's computation** |

*Source: UN Comtrade (Rwanda as reporter) via the databases indicated (Tier 2). Shares computed by the author. Years without a record in the consulted databases are not shown; the absence of a record does not imply zero trade.*

Table 16 shows that Rwanda recorded a small but recurrent flow of meat to Asian markets in every year from 2018 to 2022, to China, Hong Kong and Viet Nam. These consignments, mainly frozen bovine meat and salted or dried meat, require veterinary certification acceptable to the importing authorities, so their persistence supports the documentary link between SPS compliance and market access (H2). Yet they represented only 8.7% of HS 02 exports in 2022, so more than nine-tenths of recorded meat exports still went to regional partners, in line with the concentration reported by NAEB.

**Table 17: Rwanda's customs-recorded meat trade balance, 2021–2022 [Linked to SO4]**

| Indicator | 2021 | 2022 | Remarks |
|---|---|---|---|
| HS 02 exports (US$ million) | 1.95 | 3.91 | Rwanda-reported |
| HS 02 imports (US$ million) | 2.02 | 5.97 | Sheep and goat meat imports 95% from Kenya (2022) |
| **HS 02 trade balance (US$ million)** | **−0.07** | **−2.06** | **Net importer in both years** |
| Export–import coverage ratio, HS 02 (%) | 96.5 | 65.5 | Exports ÷ imports × 100 |
| HS 1601 sausages and similar: exports (US$ thousand) | 8.6 | 30.0 | 100% to the DRC |
| HS 1601 sausages and similar: imports (US$ thousand) | 224.3 | 361.4 | Kenya 67%; Poland 24% (2022) |
| HS 16 meat and fish preparations: imports (US$ million) | 4.35 | 10.00 | Chapter total |
| Mirror flow: Kenya's exports of frozen boneless beef to Rwanda | – | – | 2023: US$123,440 for 16,000 kg (≈ US$7.72/kg), Kenya as reporter |

*Source: UN Comtrade via TrendEconomy (2023, 2024) and World Bank (2024b) (Tier 2). Balances and ratios computed by the author.*

On a customs basis Rwanda was a net importer of meat in both years, and the deficit widened to about US$2.1 million in 2022 as imports nearly trebled. Imports of sausages and similar products were more than ten times the corresponding exports, and frozen boneless beef imported from Kenya carried a unit value of about US$7.72/kg, well above the unit value of Rwanda's own meat exports. These figures reinforce the finding that

Rwanda exports low-value, minimally processed meat while importing higher-value products, a pattern that PSTA5 and the LDS 2024–2029 aim to reverse.

**Table 18: Composition of Rwanda's agricultural export revenue, 2023/24 and 2025/26 [Linked to SO4]**

| Category | 2023/24 (US$ million) | Share (%) | 2025/26 (US$ million) | Share (%) |
|---|---|---|---|---|
| Traditional commodities (coffee, tea, pyrethrum) | 201.66 | 24.0 | 264.88 | 23.8 |
| Horticulture (fruits, vegetables, flowers) | 75.12 | 9.0 | 86.83 | 7.8 |
| Diversified/emerging commodities including livestock (total) | 562.43 | 67.0 | – | – |
| of which live animals (direct exports) | 45.55 | 5.4 | n.a. | n.a. |
| Livestock products | n.a. | n.a. | 204.79 | 18.4 |
| Other agricultural and livestock products | n.a. | n.a. | 554.28 | 49.9 |
| **Total** | **839.21** | **100.0** | **1,110.78*** | **100.0** |

*Source: NAEB (2024), Annual Report 2023–2024 (Tier 1); NAEB 2025/26 statement reported in Umunota (2026e) (Tier 3). Shares computed by the author. *Sum of reported components; NAEB reports the total as US$1.1 billion. Category definitions differ between the two years, so the livestock lines are not strictly comparable.*

NAEB's 2025/26 release is the first in the study period to report livestock products as a separate category: they earned US$204.79 million, or 18.4% of agricultural export revenue, whereas in 2023/24 live animals alone (direct exports) earned US$45.55 million, or 5.4% of the total. Because the livestock-products category combines live animals, meat, dairy, eggs, hides and other animal products, the meat component cannot be isolated. Nonetheless, the data show that the livestock sector as a whole has become a significant contributor to agri-export growth, which makes the missing meat-specific series an even more important statistical gap.

**Table 19: NAEB weekly export bulletins for livestock and livestock products, selected weeks, 2020–2026 [Linked to SO4]**

| Week | Volume (tonnes) | Value | Unit value (US$/kg) | Main destinations reported |
|---|---|---|---|---|
| 26–30 Oct 2020 | 223.9 | US$268,652 | 1.20 | DRC (99%) |
| 23–27 Feb 2026 | n.a. | Rwf 540 million | n.a. | African markets |
| 2–6 Mar 2026 | 273 | > US$437,000 | ≈ 1.60 | Oman, Nigeria and other African countries |
| 6–10 Apr 2026 | 259 | > Rwf 623 million | n.a. | n.s. |
| 20–24 Apr 2026 | 337 | > Rwf 719 million | n.a. | United States, Oman, United Kingdom, Netherlands, France, India and African countries |
| 4–8 May 2026 | 432 | Rwf 1.2 billion | n.a. | n.s. |
| 31 Aug–4 Sep 2026 | 295 | US$425,294 | ≈ 1.44 | Mainly African markets |

*Source: NAEB (2020); NAEB weekly reports as published in Umunota (2026a, 2026b, 2026c, 2026d), Top Africa News (2026) and Agaciro Press (2026) (Tier 3). Unit values computed by the author where both volume and a US$ value are reported. The category covers meat, dairy, live animals, eggs, fish, honey and other animal products; n.s. = not specified separately for livestock products.*

The weekly bulletins, although covering all livestock products rather than meat alone, point to a change in market reach between 2020 and 2026. In late 2020, 99% of livestock-product exports went to the DRC; by 2026 NAEB was reporting shipments to Oman, Nigeria, the United States, the United Kingdom, the Netherlands, France and India alongside African markets. Weekly volumes of 259–432 tonnes in 2026 compare with about 224 tonnes in the October 2020 week, while unit values of roughly US$1.44–1.60/kg remain close to the 2021/22 average for meat. These snapshots are indicative only, but they suggest early diversification beyond the DRC that a consistent annual series would allow future studies to test (H4).

### 4.1.5 Trade facilitation

**Table 20: Trade facilitation and logistics indicators for Rwanda, 2018–2026 [Linked to SO5]**

| Indicator | Value | Year | Source |
|---|---|---|---|
| Logistics Performance Index (LPI), overall score (1–5) | 2.97 (rank 57 of 160) | 2018 | World Bank (2018) |
| LPI overall score (1–5) | 2.8 | 2023 | World Bank (2023) |
| LPI: quality of trade and transport infrastructure | 2.9 | 2023 | World Bank (2023) |
| Ease of Doing Business overall rank | 38 of 190 | 2020 | World Bank (2020) |
| Airline share of horticulture air exports | RwandAir 69.1%; Ethiopian 24.1%; KLM 6.6% | 2023/24 | NAEB (2024) |
| NAEB packhouse certifications | BRCGS, RS 148:2017 (HACCP-based), ISO 9001:2015 | 2023/24 | NAEB (2024) |
| Animal Resources Permit Management System (ARPMS) | Online permits for export, import, transit and movement of animals | 2023 | MINAGRI (2024) |
| Formal domestic exports growth | +69.74% y/y (Q4 2024) | 2024 | NISR (2025) |

*Source: Compiled by the author from the documents indicated (2026). Note that the 2018 and 2023 LPI editions differ in methodology, so the two scores are only broadly comparable.*

Rwanda has a strong general business environment (38th in Doing Business 2020) and digital permit systems, but its logistics score slipped from 2.97 to 2.8 between 2018 and 2023. For perishable meat, the relevant bottlenecks are refrigerated transport, border cold storage and time at crossings rather than document processing. NAEB's certified packhouse and RwandAir cargo connectivity have benefited horticulture, but comparable meat-specific export infrastructure (a certified export abattoir, refrigerated border hubs, direct cold-chain air links) is not yet in place.

**Table 21: Export-support, re-export and cargo logistics indicators relevant to perishable exports, 2022/23–2026 [Linked to SO5]**

| Indicator | Value | Period | Source |
|---|---|---|---|
| Direct exports versus re-exports, share of agri-export earnings | 61.75% versus 38.25% | 2023/24 | NAEB (2024) |
| Re-exported diversified commodities | US$323.04 million (38.49% of revenue) | 2023/24 | NAEB (2024) |
| Total agricultural export volume | 743,532 MT → 762,420 MT (+2.5%) | 2022/23–2023/24 | NAEB (2024) |
| NAEB certified packhouse throughput | 3,419 MT (20 firms) → 2,602 MT (14 firms); −23.8% | 2022/23–2023/24 | NAEB (2024) |
| Horticultural export volume handled at the NAEB packhouse | 47.4% (Dubai port 30.3%; free zone 16%) | 2023/24 | NAEB (2024) |
| Export destinations served through Kigali International Airport | More than 40 | 2023/24 | NAEB (2024) |
| First direct Kigali–Brazzaville agri-export cargo flight | 17 tonnes | January 2026 | allAfrica (2026) |
| MINAGRI–ACES cold-chain partnership (Memorandum of Understanding) | Signed | March 2026 | MINAGRI (2026) |

*Source: Compiled by the author from the documents indicated (2026). None of the indicators is meat-specific; they describe the export logistics environment within which meat exporters operate.*

Table 21 shows that the trade-facilitation infrastructure built by NAEB is geared mainly to horticulture and re-exports: 38.25% of agri-export earnings in 2023/24 came from re-exports, and the certified packhouse handled less volume for fewer firms than in the previous year. New direct cargo links to Central Africa and a cold-chain partnership signed in 2026 are relevant to perishable meat, but no meat-specific facilitation indicator is published, which is consistent with the finding that H5 could not be established.

## 4.2 Inferential Analysis

Inferential tests were applied where the documented series allowed. Given the limited number of annual observations (n = 6–7), all results are treated as indicative associations. The tests examine links within the hypothesised chains, such as production capacity → meat output and facility type → compliance, rather than a direct factor → export relationship, which the published data do not permit.

**Table 22: Pearson correlation between livestock populations and meat output, 2017–2022/23 (n = 6) [Linked to SO1]**

| Variable paired with meat output | Pearson r | 95% CI (Fisher z) | p-value | Significant at α = 0.05 | Significant after Bonferroni (α = 0.0083) |
|---|---|---|---|---|---|
| Cattle population | 0.992 | [0.927, 0.999] | 0.0001 | Yes | Yes |
| Poultry population | 0.848 | [0.117, 0.983] | 0.0329 | Yes | No |
| Pig population | −0.708 | [−0.965, 0.243] | 0.1154 | No | No |
| Goat population | −0.848 | [−0.983, −0.116] | 0.0330 | Yes | No |
| Sheep population | −0.934 | [−0.993, −0.505] | 0.0064 | Yes | Yes |
| Total livestock biomass (TLU) | 0.442 | [−0.577, 0.923] | 0.3807 | No | No |

*Source: Author's computation from Tables 3 and 4 (2026).*

Meat output is almost perfectly correlated with the cattle population ($r = 0.992$, $p < 0.001$), and this association survives the Bonferroni adjustment; the positive correlation with poultry ($r = 0.848$, $p = 0.033$) does not, and its confidence interval is very wide. Negative correlations with goats and sheep reflect opposite trends rather than a negative effect. The weak association with total TLU suggests that herd composition and productivity matter more than aggregate herd size.

**Table 23: OLS regression estimates of meat production capacity [Linked to SO1]**

| Model | Coefficient (β) | Std. error | $R^2$ | p-value | Interpretation |
|---|---|---|---|---|---|
| M1: Meat output (MT) on time trend, 2017–2023/24 (n = 7) | 9,040 MT/year | 415 | 0.990 | <0.001 | Steady linear growth of about 9,000 MT per year |
| M2: Meat output (MT) on cattle (000 head) (n = 6) | 91.74 | 5.78 | 0.984 | <0.001 | Each additional 1,000 cattle associated with ~92 MT more meat |
| M3: ln(meat) on ln(cattle) (n = 6) | 0.736 | 0.047 | 0.984 | <0.001 | 1% more cattle associated with 0.74% more meat (output elasticity, trend-confounded) |
| M4: Δmeat on Δcattle, first differences (n = 5) | 0.041 | 0.050 | 0.182 | 0.474 | Not significant once shared trend removed |
| M5: Partial correlation, meat and cattle, controlling for linear trend (n = 6) | r = 0.292 | – | – | 0.574 | Not significant; association largely reflects common trend |
| Meat output per TLU (kg/TLU) | 112.5 → 145.7 | – | – | +29.5% | Productivity improved 2017–2022/23 |

*Source: Author's computation using SciPy from Tables 3 and 4 (2026).*

The levels regressions show a strong positive relationship between cattle stock and meat output ($\beta = 91.74$, $p < 0.001$), with a log-log coefficient of 0.74. However, the first-difference model (M4) and the trend-partialled correlation (M5) are not significant, indicating that much of the association reflects a common upward trend, a typical risk in short time series (Gujarati & Porter, 2009). The cattle–meat link remains plausible on technical grounds, since cattle are the principal source of red meat, but the statistics alone cannot separate it from the shared trend. Meat produced per TLU rose by 29.5%, suggesting that productivity gains (improved breeds, feeding and offtake) supplemented herd expansion. Importantly, these models explain meat *output*, not meat *exports*; they bear on the first link of H1 only

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**Table 24: Chi-square test of independence of compliance level by facility type (RICA, 2022) [Linked to SO2]**

| Facility type | ≥70% (obs / exp) | 50–69% (obs / exp) | <50% (obs / exp) | Total |
|---|---|---|---|---|
| Slaughterhouses | 7 / 5.10 | 20 / 28.99 | 21 / 13.91 | 48 |
| Butcheries | 15 / 16.90 | 105 / 96.01 | 39 / 46.09 | 159 |
| Total | 22 | 125 | 60 | 207 |
| **Test statistics** | **$\chi^2 = 9.246$; df = 2; p = 0.0098** | **Cramér's V = 0.21** | **Fisher exact, <50% band: OR = 2.39, p = 0.017** | **Fisher exact, ≥70% band: OR = 1.64, p = 0.297** |

*Source: Author's computation from Table 6 (2026). Counts are Tier 3 (RICA data reported by Beautiful Rwanda, 2022); the test should be re-run on the primary RICA report when available.*

The chi-square test ($\chi^2 = 9.25$, df = 2, p = 0.010) shows that compliance distributions differ by facility type, with a small-to-moderate effect size (Cramér's V = 0.21). The difference is concentrated in the lowest band: slaughterhouses had 2.4 times the odds of scoring below 50% (p = 0.017), but they were not significantly less likely than butcheries to reach 70% or above (p = 0.297). This test establishes an association between facility type and compliance level; it does not measure the effect of sanitary standards on exports. The link to export access rests on documentary evidence that export eligibility is certified at the slaughter stage, so the weakest compliance node is also the one that governs entry to formal export markets.

**Table 25: Export-to-output growth ratio and value-addition indicators [Linked to SO1, SO3, SO4 and SO5]**

| Indicator | Computation | Value | Interpretation |
|---|---|---|---|
| Growth of meat export value, 2021/22–2022/23 | (22.30 / 8.87) − 1 | +151.4% | Rapid export response (Tier 3 endpoint) |
| Growth of meat output over same period | (197,778 / 185,989) − 1 | +6.34% | Moderate supply growth |
| Export-to-output growth ratio | 151.4 / 6.34 | ≈ 23.9 | Descriptive two-point ratio; not an elasticity; inflated by small base and border reopening |
| Meat export intensity (2021/22) | 5,485 MT / 185,989 MT | 2.95% | Only ~3% of output exported |
| Live animals vs. meat export value (2021/22) | 23.52 / 8.87 | 2.65 : 1 | Low value addition |
| Meat share of agri-exports | 8.87 / 640.9; 22.30 / 857.2 | 1.38% → 2.60% | Marginal but rising |
| LPI change 2018–2023 | (2.8 / 2.97) − 1 | −5.7% | Logistics score did not improve |

*Source: Author's computation from Tables 4, 8, 12, 13 and 20 (2026).*

Export value grew about 23.9 times faster than output between 2021/22 and 2022/23. This figure is reported as an export-to-output growth ratio rather than an export elasticity, because it is computed from a single pair of growth rates and not estimated from a series; a formal elasticity would require regressing ln(exports) on ln(output) over many periods, which the data do not permit. The high ratio arises mainly because exports start from a very small base (about 3% of output), so that modest increases in exportable surplus, combined with the post-COVID reopening of borders, produce large percentage gains. The 2.65:1 ratio of live-animal to meat exports quantifies the value-addition gap, while the 5.7% decline in the LPI score shows that the export surge occurred despite, not in step with, measured logistics performance.

## 4.3 Assessment of Hypotheses

**Table 26: Summary of evidence on the hypothesised relationships [Linked to SO1–SO5]**

| Hypothesis | Level A: inferential evidence | Levels B–C: documentary evidence | What the evidence does not show | Assessment |
|---|---|---|---|---|
| H1: Production capacity (+) export performance | Cattle–meat output r = 0.992, p < 0.001; log-log 0.74; not significant in first differences (p = 0.47) | Output +36.2% (2017–2023/24); export intensity 2.95%; exports rose as output rose (two observations) | A statistical link between production capacity and exports | Partially consistent: capacity–output link supported; output–export link documentary only |
| H2: SPS compliance (+) export market access | Compliance × facility type $\chi^2 = 9.25$, p = 0.010, V = 0.21 | 14.6% of slaughterhouses ≥70%; FMD coverage ~16%; certified sales to China/Hong Kong; disease disruptions | The effect of compliance on export value or volume | Consistent with documentary evidence |
| H3: Value addition (+) export value and unit value | None feasible | Live:meat value 2.65:1; meat unit value US$1.62/kg; HS 1601 ≈ US$29k; abattoir under-use | A test of value addition on export value over time | Consistent with documentary evidence |
| H4: Diversification (+) export performance | None feasible | > 90% regional destinations; meat share ≤ 2.6%; small certified extra-regional sales | A diversification–performance relationship over time | Consistent with descriptive evidence only |
| H5: Trade facilitation (+) export performance | None feasible (two LPI observations) | LPI −5.7% while exports +151.4%; cold-chain and border storage gaps | Any co-movement between logistics and exports | Not established |

***Source: Author's synthesis of Tables 3–25 (2026), applying the evidence standard in Section 3.3.***

**H1** is partially consistent with the evidence: production capacity, particularly the cattle herd, is strongly associated with meat output in levels, and exports rose as output grew, but meat output is not export performance, the output–export link rests on only two annual observations, and the cattle–output association weakens once the common trend is removed. **H2** is consistent with the documentary evidence: sanitary non-compliance is concentrated at the slaughter stage and differs significantly by facility type, and certified supply is a documented precondition for extra-regional markets, although no test links compliance directly to export outcomes. **H3** is consistent with the documentary evidence: the dominance of live-animal exports, low meat unit values and negligible processed-meat exports indicate that limited value addition coincides with low export earnings. **H4** is consistent with descriptive evidence: exports are concentrated in proximity markets and remain marginal in value, but the absence of a destination series precludes testing whether diversification improves performance. **H5** is not established: facilitation reforms are documented, but measured logistics performance did not move with export growth, and the data do not allow any relationship to be estimated, although the literature indicates that cold-chain logistics matter for perishables (Djankov et al., 2010; Hummels & Schaur, 2013).

## 4.4 Discussion of Results

**Production capacity.** The close tracking of meat output and cattle numbers is consistent with the Rwanda Livestock Master Plan's projection that red meat surpluses depend on cattle offtake and feedlot development (Shapiro et al., 2017) and with Heckscher–Ohlin reasoning that export capacity reflects factor endowments (Ohlin, 1933). However, the decline in goats, sheep and pigs, species with shorter production cycles and strong regional demand, weakens diversification, mirroring the LDS finding that small-ruminant decline stems from poor genetics, inbreeding, feed shortages and disease (MINAGRI, 2024). The high export-to-output growth ratio, which arises from a very small export base, is consistent with Freund and Rocha's (2011) argument that African export growth is constrained by thin supply bases.

**Sanitary standards.** Low compliance at slaughterhouses is consistent with the literature on SPS as a binding constraint (Henson & Jaffee, 2008; Otsuki et al., 2001). Rwanda's policy trajectory aligns with the "standards as catalyst" perspective: RICA's inspections, the refrigeration mandate and pig abattoir investments are building compliance capacity (Jaffee & Henson, 2004; Swinnen, 2016). Low FMD vaccination coverage supports Thomson et al.'s (2004) argument that commodity-based trade approaches may be more realistic than country-wide disease freedom for African exporters.

**Value addition.** Exporting live animals rather than meat reflects a weak position within the regional value chain, in which processing functions are captured by importers (Gereffi et al., 2005; Kaplinsky & Morris, 2001). The results echo Ethiopian evidence that informal live-animal trade outcompetes export abattoirs when abattoirs face higher costs and compliance burdens (Aklilu et al., 2002; Legese et al., 2008). MINAGRI's estimate of about US$7 more per kilogram of meat exported compared with live animals signals substantial foregone earnings (MINAGRI, 2017).

**Market access.** The concentration of exports in the DRC is consistent with gravity-model predictions, since proximity lowers trade costs (Anderson & van Wincoop, 2003; Tinbergen, 1962). Nevertheless, dependence on one market exposes Rwanda to security and diplomatic risks. AfCFTA and EAC provide preferential access, but non-tariff and SPS measures, as documented by Disdier et al. (2008), shape effective access. Emerging extra-regional sales to China and Hong Kong demonstrate the potential of certified niche products.

**Trade facilitation.** Rwanda's strong business climate did not translate into better logistics scores. Studies show that time costs are particularly damaging for perishable goods (Djankov et al., 2010; Hummels & Schaur, 2013) and that hard and soft infrastructure improvements raise exports (Portugal-Perez & Wilson, 2012; Wilson et al., 2003). That H5 could not be established most likely reflects data limitations and the fact that most meat currently moves short distances across land borders, where national facilitation indicators are less relevant than cold-chain availability; it should not be read as evidence that logistics do not matter.

**Supplementary trade evidence.** The HS-level data add three points to this discussion. First, recurrent certified shipments of frozen and dried meat to China, Hong Kong and Viet Nam between 2018 and 2022 fetched unit values close to three times the average for exported meat, reinforcing the standards-as-catalysts interpretation (Jaffee & Henson, 2004). Second, Rwanda was a net importer of meat on a customs basis in 2021–2022 and imported higher-value processed products, which mirrors the weak value-chain position described by Kaplinsky and Morris (2001). Third, the gap between NAEB and customs figures, together with largely unrecorded cross-border trade with the DRC, means that the true export response to production growth remains uncertain, which strengthens the case for recommendation (vi).

## 4.5 Limitations

Five limitations qualify the findings. First, the annual series are short (n = 6–7) and trending, so correlations are vulnerable to spurious association and cannot support causal inference. Second, no consistent meat export series is published for 2017/18–2020/21 or after 2022/23, so the tests address intermediate outcomes rather than exports directly. Third, some key statistics, including the RICA counts and the 2022/23 export

value, are Tier 3 and should be re-verified against primary releases. Fourth, informal cross-border trade with the DRC is largely unrecorded, which probably understates exports. Fifth, fiscal and calendar years were harmonised approximately, and the 2018 and 2023 LPI editions are only broadly comparable.

The supplementary statistics introduce two further qualifications. Customs-recorded HS 02 values and NAEB/NISR meat values differ by a factor of about 4.5–5.7 (Table 14), so conclusions about the level of meat exports depend on the source used; and the NAEB weekly bulletins and the 2025/26 release cover livestock products as a whole, so they document the direction of change rather than meat exports specifically.

# 5. Conclusion and Recommendations

## 5.1 Conclusion

This documentary study analysed the factors associated with meat export performance in Rwanda over 2017–2026. Meat output grew steadily from 152,029 MT to 207,097 MT, driven primarily by cattle, and meat exports rose from US$8.87 million in 2021/22 to US$22.3 million in 2022/23. Nevertheless, meat remained below 3% of agricultural export revenue; live animals were worth 2.65 times more than meat exports; sanitary compliance at slaughterhouses was low and differed significantly from that at butcheries; exports were concentrated in neighbouring markets; and logistics performance stagnated. The evidence is consistent with the propositions that sanitary standards, value addition and market diversification are associated with Rwanda's meat export performance, and partially consistent with the role of production capacity, whereas an association with trade facilitation could not be established with the available data. Because these conclusions rest on short series and documentary triangulation, they describe associations rather than causal effects. Taken together, they indicate that Rwanda's meat export potential is real but under-realised, and that the principal constraints appear to lie beyond the farm gate, at the slaughter, processing, certification and logistics stages.

### 5.2 Recommendations

**Based on the findings of this study, the following recommendations were made:**

1. **MINAGRI and RAB** should raise productivity through beef feedlots, the National Animal Genetic Improvement Centre, pig and poultry breeding centres and feed reserves, and reverse the decline in goats, sheep and pigs to widen the exportable surplus beyond cattle.
2. **RICA, RAB and districts** should enforce Ministerial Order No. 012/11.30 on slaughtering and meat inspection, close non-compliant slaughterhouses, roll out a RICA seal of approval, raise FMD vaccination coverage and pilot disease-controlled export zones for commodity-based certification.
3. **MINICOM, RDB and the private sector** should phase down live-animal exports through incentives for export-grade abattoirs (HACCP, ISO 22000, halal), chilling and deboning plants and by-product processing, and scale PPP models such as Gako Meat Company.
4. **NAEB and MINAFFET** should diversify markets beyond the DRC toward EAC, Gulf and Asian buyers, use AfCFTA and EAC protocols to negotiate SPS equivalence, and include meat in export promotion and trade missions.
5. **MININFRA, RRA and NAEB** should establish refrigerated border hubs at Rubavu and Rusizi, refrigerated truck schemes and a meat export packhouse at Kigali International Airport, and integrate ARPMS with the Electronic Single Window.
6. **NISR and NAEB** should publish a consistent annual (preferably monthly) series on meat export value, volume, species and destination, and RICA should publish its inspection results in full, to strengthen monitoring under PSTA5 and NST2 and enable rigorous econometric research.

**Suggestions for further research.** Once at least 15–20 annual or monthly observations are available, future studies should estimate ARDL or panel gravity models of meat exports and formal export elasticities, combine customs microdata with firm-level surveys of abattoirs and exporters, verify the Tier 3 statistics used here against primary releases, and quantify informal cross-border meat trade with the DRC.

**References**


African Union. (2018*).* Agreement establishing the African Continental Free Trade Area. *African Union Commission.*

Agaciro Press. (2026, September). Rwanda agricultural and livestock products generate over Frw 22 billion in one week [NAEB weekly report, 31 August–4 September 2026]. *Agaciro Press*.

Agri4Africa. (2024, March 24). Rwanda closer to reaching agricultural export target. *Agri4Africa*.

Agrilinks. (2022, October 6). How to improve meat safety in Rwanda as demand rises. *Agrilinks (USAID Feed the Future).*

Aklilu, Y., Irungu, P., & Reda, A. (2002). An audit of the livestock marketing status in Kenya, Ethiopia and Sudan. *AU-IBAR.*

allAfrica. (2022, May 17). Rwanda injects Rwf1.4 billion in standardising pig slaughtering. *allAfrica* (The New Times).

allAfrica. (2023, February 20). Rwanda's annual agric export revenues reach Rwf860 billion. *allAfrica*.

allAfrica. (2024, January 29). Rwanda: Modern abattoirs count losses as communities opt for home slaughtering. *allAfrica*.

allAfrica. (2026, January 25). Rwanda: Export revenues quadruple in five years as NAEB expands international markets for horticulture. *allAfrica*.

Anderson, J. E., & van Wincoop, E. (2003). Gravity with gravitas: A solution to the border puzzle. *American Economic Review, 93*(1), 170–192.

Balassa, B. (1965). Trade liberalisation and "revealed" comparative advantage. *The Manchester School, 33*(2), 99–123.

Bantu Gazette. (2026, August 16). Rwanda's agricultural export revenue surpasses $1 billion in 2025–26. *Bantu Gazette*.

Barney, J. (1991). Firm resources and sustained competitive advantage. *Journal of Management, 17*(1), 99–120.

Beautiful Rwanda. (2022, May 27). Why government is cracking down on abattoirs, butcheries. *Beautiful Rwanda*.

Bowen, G. A. (2009). Document analysis as a qualitative research method. *Qualitative Research Journal, 9*(2), 27–40.

Cadot, O., Carrère, C., & Strauss-Kahn, V. (2011). Export diversification: What's behind the hump? *Review of Economics and Statistics, 93*(2), 590–605.

Creswell, J. W., & Creswell, J. D. (2018). Research design: Qualitative, quantitative, and mixed methods approaches (5th ed.). *SAGE.*

Delgado, C., Rosegrant, M., Steinfeld, H., Ehui, S., & Courbois, C. (1999). Livestock to 2020: The next food revolution (Food, Agriculture and the Environment Discussion Paper No. 28). *IFPRI, FAO & ILRI.*

Disdier, A.-C., Fontagné, L., & Mimouni, M. (2008). The impact of regulations on agricultural trade: Evidence from the SPS and TBT agreements. *American Journal of Agricultural Economics, 90*(2), 336–350.

Djankov, S., Freund, C., & Pham, C. S. (2010). Trading on time. *Review of Economics and Statistics, 92*(1), 166–173.

Down to Earth. (2016, September 5). Rwanda to phase out live animal export; boost trade in processed meat. *Down to Earth*.

East African Community. (2010). Protocol on the establishment of the East African Community Common Market. *EAC Secretariat.*

FAO. (2011). Guidelines for the preparation of livestock sector reviews (Animal Production and Health Guidelines No. 5). *Food and Agriculture Organization of the United Nations.*

FAO. (2023). World food and agriculture – Statistical yearbook 2023. *Food and Agriculture Organization of the United Nations.*

Feed the Future Innovation Lab for Livestock Systems. (2022). The livestock system in Rwanda: An overview. *University of Florida & ILRI.*

Food Business MEA. (2025a, February 13). Rwanda to target 20% increase in meat production by 2029, government says. *Food Business Middle East & Africa*.

Food Business MEA. (2025b, November 21). Rwanda ends eight-year ban on South African meat, agricultural imports. *Food Business Middle East & Africa*.

Food Safety Africa. (2023, March 19). Rwanda moves to improve meat safety, bans sale of unrefrigerated meat. *Laboratory Management MEA*.

Freund, C., & Rocha, N. (2011). What constrains Africa's exports? *World Bank Economic Review, 25*(3), 361–386.

Gereffi, G., Humphrey, J., & Sturgeon, T. (2005). The governance of global value chains. *Review of International Political Economy, 12*(1), 78–104.

Gujarati, D. N., & Porter, D. C. (2009). *Basic econometrics* (5th ed.). McGraw-Hill.

Hausmann, R., Hwang, J., & Rodrik, D. (2007). What you export matters. *Journal of Economic Growth, 12*(1), 1–25.

Henson, S., & Jaffee, S. (2008). Understanding developing country strategic responses to the enhancement of food safety standards. *The World Economy, 31*(4), 548–568.

Hummels, D. L., & Schaur, G. (2013). Time as a trade barrier. *American Economic Review, 103*(7), 2935–2959.

Humphrey, J., & Schmitz, H. (2002). How does insertion in global value chains affect upgrading in industrial clusters? *Regional Studies, 36*(9), 1017–1027.

Jaffee, S., & Henson, S. (2004). Standards and agro-food exports from developing countries: Rebalancing the debate (Policy Research Working Paper No. 3348). *World Bank.*

Johnston, M. P. (2014). Secondary data analysis: A method of which the time has come. *Qualitative and Quantitative Methods in Libraries, 3*, 619–626.

Kaplinsky, R., & Morris, M. (2001). A handbook for value chain research. *IDRC.*

Legese, G., Teklewold, H., Alemu, D., & Negassa, A. (2008). Live animal and meat export value chains for selected areas in Ethiopia (IPMS Working Paper No. 9). *ILRI.*

Leonidou, L. C., Katsikeas, C. S., & Samiee, S. (2002). Marketing strategy determinants of export performance: A meta-analysis. *Journal of Business Research, 55*(1), 51–67.

Limão, N., & Venables, A. J. (2001). Infrastructure, geographical disadvantage, transport costs, and trade. *World Bank Economic Review, 15*(3), 451–479.

LVVN. (2024). Rwanda's agri-economic outlook, April 2024. *Netherlands Ministry of Agriculture, Fisheries, Food Security and Nature, Agroberichten Buitenland.*

Maertens, M., & Swinnen, J. F. M. (2009). Trade, standards, and poverty: Evidence from Senegal. *World Development, 37*(1), 161–178.

Mahoro, J., Muasya, T. K., Mbuza, F., Habimana, R., & Kahi, A. K. (2017). Characterization of indigenous chicken production systems in Rwanda. *Poultry Science, 96*(12), 4245–4252.

Melitz, M. J. (2003). The impact of trade on intra-industry reallocations and aggregate industry productivity. *Econometrica, 71*(6), 1695–1725.

Ministry of Agriculture and Animal Resources. (2017). Strategies to increase Rwanda meat export underway [News release]. *MINAGRI.*

Ministry of Agriculture and Animal Resources. (2018). *Strategic plan for agriculture transformation 2018–2024 (PSTA4)*. MINAGRI.

Ministry of Agriculture and Animal Resources. (2022). *Annual report 2021–2022*. MINAGRI.

Ministry of Agriculture and Animal Resources. (2024). *Livestock development strategy 2024–2029*. MINAGRI.

Ministry of Agriculture and Animal Resources. (2026). *Rwanda strengthens agricultural value chains through MINAGRI–ACES cold-chain partnership* [News release]. MINAGRI.

Ministry of Trade and Industry. (2016). Rwanda livestock and meat export to DRC: Strategy report. *MINICOM.*

Munyaneza, J. P., Rukundo, J. de D., & Niyonsaba, A. (2022). Review on challenges and opportunities of poultry production systems, genetic resources, and improvement in Rwanda. *Journal of Animal Breeding and Genomics*.

National Agricultural Export Development Board. (2019). *NAEB strategic business plan 2019–2024: Increasing agri-export revenues*. *NAEB.*

National Agricultural Export Development Board. (2020). Last week export performance [Weekly export bulletin, 26–30 October 2020]. *NAEB.*

National Agricultural Export Development Board. (2024). Annual report: Agricultural export performance 2023–2024. *NAEB.*

National Institute of Statistics of Rwanda. (2022). Rwanda statistical yearbook 2022. *NISR.*

National Institute of Statistics of Rwanda. (2023). Fifth population and housing census 2022 (RPHC5): Main indicators. *NISR.*

National Institute of Statistics of Rwanda. (2024). Formal external trade in goods report, Q2 2024. *NISR.*

National Institute of Statistics of Rwanda. (2025). *Formal external trade in goods reports, Q4 2024 and Q3 2025*. *NISR.*

Ntabakirabose, G., Mbabazize, M., Mpatswenumugabo, J. P., Izamuhaye, J. C., & Mburu, D. M. (2022). *Impact of zero grazing practices on livestock production among smallholder farmers in Rwanda: A case study of Burera and Gicumbi districts*.

OECD & FAO. (2023). *OECD*-FAO agricultural outlook 2023–2032. *OECD Publishing.*

Ohlin, B. (1933). *Interregional and international trade*. Harvard University Press.

Otsuki, T., Wilson, J. S., & Sewadeh, M. (2001). Saving two in a billion: Quantifying the trade effect of European food safety standards on African exports. *Food Policy, 26*(5), 495–514.

Perry, B., & Grace, D. (2009). The impacts of livestock diseases and their control on growth and development processes that are pro-poor. *Philosophical Transactions of the Royal Society B, 364*(1530), 2643–2655.

Porter, M. E. (1990). *The competitive advantage of nations*. Free Press.

Portugal-Perez, A., & Wilson, J. S. (2012). Export performance and trade facilitation reform: Hard and soft infrastructure. *World Development, 40*(7), 1295–1307.

Rich, K. M., & Perry, B. D. (2011). The economic and poverty impacts of animal diseases in developing countries. *Preventive Veterinary Medicine, 101*(3–4), 133–147.

Rich, K. M., Perry, B. D., & Kaitibie, S. (2009). Commodity-based trade and market access for developing country livestock products: The case of beef exports from Ethiopia. *International Food and Agribusiness Management Review, 12*(3), 1–22.

Rwanda Today. (2020, October 15). Untapped meat export market in DR Congo. *Rwanda Today*.

Scott, J. (1990). A matter of record: Documentary sources in social research. *Polity Press.*

Shapiro, B. I., Gebru, G., Desta, S., Negassa, A., Nigussie, K., Aboset, G., & Mechale, H. (2017). *Rwanda livestock master plan*. ILRI & MINAGRI.

Shyaka, A., Quinnell, R. J., Rujeni, N., & Fèvre, E. M. (2022). Using a value chain approach to map the pig production system in Rwanda, its governance, and sanitary risks. *Frontiers in Veterinary Science, 8*, Article 720553.

Snyder, H. (2019). Literature review as a research methodology: An overview and guidelines. *Journal of Business Research, 104*, 333–339.

Sousa, C. M. P. (2004). Export performance measurement: An evaluation of the empirical research in the literature. *Academy of Marketing Science Review, 9*, 1–23.

Swinnen, J. (2016). Economics and politics of food standards, trade, and development. *Agricultural Economics, 47*(S1), 7–19.

The Farmer's Journal Africa. (2025, February 10). Rwanda targets 20% increase in meat production by 2029. *The Farmer's Journal Africa*.

Thomson, G. R., Tambi, E. N., Hargreaves, S. K., Leyland, T. J., Catley, A. P., van 't Klooster, G. G. M., & Penrith, M.-L. (2004). International trade in livestock and livestock products: The need for a commodity-based approach. *Veterinary Record, 155*(14), 429–433.

Tinbergen, J. (1962). Shaping the world economy: Suggestions for an international economic policy. *Twentieth Century Fund.*

Top Africa News. (2026, May 2). Five days, billions generated: Rwanda's agro-export sector hits remarkable milestone. *Top Africa News*.

Trading Economics. (2026). Rwanda exports of meat and edible meat offal to China and Hong Kong [Data set; UN Comtrade]. *Trading Economics.*

Trading Economics. (2026b). Rwanda exports to Viet Nam and to the Democratic Republic of the Congo by product [Data set; UN Comtrade]. *Trading Economics.*

TrendEconomy. (2023). Rwanda imports and exports: Sausages and similar products (HS 1601), 2011–2022 [Data set; UN Comtrade]. *TrendEconomy.*

TrendEconomy. (2024). Rwanda imports and exports: Live swine (HS 0103), meat of sheep or goats (HS 0204) and pig and poultry fat (HS 0209), with chapter totals for HS 01, 02 and 16, 2011–2022 [Data set; UN Comtrade]. *TrendEconomy.*

Umunota. (2026a). Rwanda earns over Rwf11.4 billion from agricultural exports in five days [NAEB weekly report, 23–27 February 2026]. *Umunota*.

Umunota. (2026b). Rwanda earns over 14 billion FRW from agricultural exports in just five days [NAEB weekly report, 2–6 March 2026]. *Umunota*.

Umunota. (2026c). Rwanda earns Frw 11.2 billion from agricultural exports in five days [NAEB weekly report, 6–10 April 2026]. *Umunota*.

Umunota. (2026d). Rwanda earns over Rwf 14.1 billion from agricultural exports in five days [NAEB weekly report, 4–8 May 2026]. *Umunota*.

Umunota. (2026e). Rwanda's agricultural exports surpass $1.1 billion for the first time. *Umunota*.

Umutesi, A. (2024, April 1). A look at meat: Rwanda's emerging export. *The New Times*.

Wilson, J. S., Mann, C. L., & Otsuki, T. (2003). Trade facilitation and economic development: A new approach to quantifying the impact. *World Bank Economic Review, 17*(3), 367–389.

World Bank. (2018). Connecting to compete 2018: Trade logistics in the global economy. *World Bank.*

World Bank. (2020*).* Doing business 2020: Comparing business regulation in 190 economies. *World Bank.*

World Bank. (2023). Connecting to compete 2023: Trade logistics in an uncertain global economy. *World Bank.*

World Bank. (2024a). World Integrated Trade Solution: Rwanda frozen boneless bovine meat (HS 020230) exports by country, 2021 [Data set; UN Comtrade]. *World Bank.*

World Bank. (2024b). World Integrated Trade Solution: Kenya frozen boneless bovine meat (HS 020230) exports by country, 2023 [Data set; UN Comtrade]. *World Bank.*

World Trade Organization. (1995). Agreement on the application of sanitary and phytosanitary measures. *WTO.*

World Trade Organization. (2014). Agreement on trade facilitation. *WTO.*

Zou, S., & Stan, S. (1998). The determinants of export performance: A review of the empirical literature between 1987 and 1997. *International Marketing Review, 15*(5), 333–356.