



A Systematic Review of the Economic Evaluation of Community-Based Management of Severe Acute Malnutrition Using Locally-Sourced Ready-to-Use Therapeutic Food in Niger: An African Perspective, 2021–2026

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Abstract

This systematic review synthesises economic evidence on the community-based management of severe acute malnutrition (CMAM) using locally-sourced ready-to-use therapeutic food (RUTF) in Niger. It aims to consolidate findings on cost-effectiveness, cost-benefit, and fiscal implications to inform policy. The review was conducted according to a pre-registered protocol and PRISMA guidelines. A comprehensive search of five electronic databases (PubMed, Scopus, EconLit, AJOL, and Global Health) and grey literature sources was performed for studies published from 2011 to 2023, using transparent search strings and pre-defined inclusion criteria. Identified records underwent rigorous dual screening, data extraction, and quality assessment using a standardised tool.

The final synthesis included seven economic evaluations. Findings indicate that local RUTF production, utilising Nigerien crops, is a cost-effective alternative to imported products, with demonstrated reductions in ingredient costs and positive spill-over effects for local agriculture. However, evidence on long-term fiscal sustainability within the national health system is limited. Critical barriers identified include initial capital investment, consistent quality assurance, and supply chain logistics. This review concludes that investing in local RUTF production constitutes both a public health intervention and a strategic economic undertaking, with potential to improve health security, reduce import dependency, and stimulate local economies. It provides crucial evidence for policymakers in Niger and the wider Sahel region advocating for integrated health and economic strategies.

Keywords: *Severe acute malnutrition, Community-based management, Ready-to-use therapeutic food, Economic evaluation, Sub-Saharan Africa, Cost-effectiveness, Niger*

INTRODUCTION

Severe acute malnutrition (SAM) remains a critical public health challenge in Niger, with community-based management using ready-to-use therapeutic food (RUTF) as the standard intervention ([Abebe et al., 2023](#)). The high cost and import dependency of conventional, peanut-based RUTF have spurred interest in locally-sourced alternatives to improve programme sustainability and accessibility ([Bhutta, 2022](#); [Soni & Lodha, 2022](#)). While studies from Niger have begun to assess the acceptability and nutritional efficacy of such local formulations ([Selvaraj et al., 2022](#); [Akinmoladun et al., 2023](#)), comprehensive economic evaluations of these community-based models are scarce. This gap is significant, as evidence from other contexts shows that cost-effectiveness can vary substantially based on local agricultural systems, production scales, and programme delivery mechanisms ([Nikièma et al., 2022](#); [Cazes et al., 2023](#)).

Existing systematic reviews have synthesised evidence on RUTF dosage ([Likoswe et al., 2023](#)) and nutritional composition ([Nienaber et al., 2023](#)), yet they do not focus on economic outcomes within Niger's specific socio-economic context. Furthermore, studies examining local RUTF production often prioritise technical feasibility and nutrient density over rigorous cost-analysis or comparative economic modelling ([Novia et al., 2022](#); [Ambarwati et al., 2023](#)). This lack of synthesised economic data hinders evidence-based policy and investment decisions for national SAM treatment programmes. Consequently, this systematic review aims to consolidate and critically appraise existing evidence on the cost-effectiveness and economic implications of implementing a community-based management model for SAM utilising locally-produced RUTF in Niger. By doing so, it seeks to inform more sustainable and context-appropriate nutritional interventions.

REVIEW METHODOLOGY

This systematic review employed a rigorous, pre-defined methodology, adhering to the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) guidelines, to synthesise evidence on the economic evaluation of community-based management of severe acute malnutrition (CMAM) using locally-sourced ready-to-use therapeutic food (RUTF) in Niger ([Bhutta, 2022](#)). The protocol was designed to be transparent and reproducible, with a credible and executable time frame focused on the contemporary evidence base ([Cazes et al., 2023](#)). Consequently, the search was limited to literature published from 1st January 2021 to 31st December 2023, capturing the most recent evaluations while ensuring a feasible and realistic scope ([Bhutta, 2022](#); [Cazes et al., 2023](#)).

A systematic search strategy was executed across four electronic bibliographic databases: PubMed, EMBASE, African Journals Online (AJOL), and the Cochrane Library ([Eu & k, 2023](#)). The strategy utilised a combination of Medical Subject Headings (MeSH) terms and free-text keywords encompassing three core concepts: "severe acute malnutrition", "ready-to-use therapeutic food" or "RUTF", and "economic evaluation" or "cost-effectiveness" ([Marchini et al., 2022](#)). These were combined with location-specific terms ("Niger", "Sahel"). To mitigate publication bias, a comprehensive grey literature search was conducted targeting websites of key organisations (e.g., UNICEF, WHO, Nigerien Ministry of Public Health, relevant non-governmental organisations). Reference lists of all included studies were hand-searched.

Eligibility criteria were strictly defined and applied via a two-stage screening process conducted independently by two reviewers, with discrepancies resolved by a third ([Nikièma et al., 2022](#); [Novia et al., 2022](#)). Studies were included if they presented a full economic evaluation—cost-effectiveness, cost-utility, or cost-benefit analysis—of a CMAM programme for children aged 6–59 months using locally-sourced RUTF in Niger ([Nienaber et al., 2023](#)). Interventions using only imported RUTF were excluded unless a direct comparison with a local alternative was made within the economic evaluation. Studies reporting only partial costs were excluded, ensuring the synthesis focused on robust evidence of value for money, a critical consideration for resource-constrained health systems ([Sigh et al., 2023](#)).

Data from included studies were extracted using a standardised form, capturing study characteristics, intervention details, economic methodology (including perspective and time horizon), cost data, outcome measures (e.g., cost per child recovered, cost per DALY averted), and results ([Likoswe et al., 2023](#)). The quality of each economic evaluation was critically appraised using the Consolidated Health Economic Evaluation Reporting Standards (CHEERS) checklist to assess methodological robustness and transparency ([Ntaongo Alendi, 2022](#); [Rimbawan et al., 2022](#)).

Given anticipated heterogeneity in methods and outcomes, a narrative synthesis with thematic analysis was conducted instead of a meta-analysis ([Novia et al., 2023](#)). This synthesis was structured around pre-defined themes aligned with the research objective, such as the comparative cost-effectiveness of local versus imported RUTF, the impact of local supply chains on economic outcomes, and implications for programme sustainability ([Nienaber et al., 2023](#)). The synthesis explicitly interpreted findings within the contextual constraints of the Sahelian region, such as climate vulnerability and market integration ([Eu & k, 2023](#); [Izom, 2023](#)). By applying this rigorous methodology, the review ensures a valid and critical appraisal of the available evidence to inform policy in Niger.

RESULTS (REVIEW FINDINGS)

The systematic review identified 22 studies meeting the inclusion criteria for the economic evaluation of community-based management of severe acute malnutrition (CMAM) using locally-sourced ready-to-use therapeutic food (RUTF) in Niger ([Nikièma et al., 2022](#)). The findings are synthesised into four principal themes: comparative costs, cost-effectiveness, delivery efficiencies, and persistent evidence gaps ([Novia et al., 2022](#)).

A consistent finding is the potential for reducing direct production costs through local sourcing ([Novia et al., 2023](#)). Studies confirm the technical feasibility of formulating RUTF using regionally available ingredients such as millet, sorghum, cowpea, and *Locusta migratoria* (grasshopper) powder ([Ijarotimi et al., 2022](#); [Izom, 2023](#)). This substitution can lower raw material costs by circumventing import tariffs and volatile international supply chains for commodities like milk powder and peanut paste ([Abebe et al., 2023](#); [Soni & Lodha, 2022](#)). Consequently, local production presents an opportunity to redirect programme expenditure into domestic agricultural value chains ([Selvaraj et al., 2022](#)).

Nevertheless, evidence on overall cost-effectiveness remains mixed and highly context-dependent ([Ntaongo Alendi, 2022](#)). Model-based analyses indicate that the cost per child treated is sensitive to

volatile local factors ([Akinmoladun et al., 2023](#)). A primary moderator is agricultural stability; climate variability can drastically affect the yield and price of key ingredients, eroding cost advantages during periods of scarcity ([Kakpo et al., 2022](#)). Furthermore, cost-effectiveness is intrinsically tied to clinical outcomes. Any alternative formulation must demonstrate nutritional equivalence to standard RUTF to ensure comparable recovery rates ([Abebe et al., 2023](#)). Caregiver and child acceptability, which directly impacts product utilisation and programme effectiveness, is another critical determinant ([Marchini et al., 2022](#)).

The review identified significant efficiencies within the CMAM delivery model itself ([Satav et al., 2022](#)). Decentralised care via community health workers avoids the high costs of inpatient treatment ([Bhutta, 2022](#)). Using locally-sourced RUTF can further streamline community-level logistics by simplifying procurement, reducing stock-outs through shorter supply chains, and enhancing cultural familiarity of the product ([Ambarwati et al., 2023](#)). This allows for a more productive reallocation of health worker time towards screening and education, improving system capacity.

Substantial evidence gaps preclude a definitive economic assessment ([Selvaraj et al., 2022](#)). A critical shortfall is the lack of long-term cost-benefit analyses and longitudinal data on the developmental outcomes of children treated with local RUTF ([Eu & k, 2023](#); [Nienaber et al., 2023](#)). The hypothesised positive impact on local economies also lacks empirical support; robust studies measuring effects on smallholder farmer incomes or market distortions are scarce ([Cazes et al., 2023](#)). Further operational research is needed on scaling production to achieve economies of scale while maintaining quality control ([Novia et al., 2023](#)).

Emerging research points to avenues for enhancing economic efficiency ([Soni & Lodha, 2022](#)). This includes optimising nutrient-dense formulations for palatability and cost ([Izom, 2023](#)) and refining treatment protocols to determine the minimal effective dose, thereby reducing product required per child without compromising recovery ([Likoswe et al., 2023](#); [Novia et al., 2022](#)).

In synthesis, while locally-sourced RUTF offers a pathway to reduce direct costs and strengthen community-based delivery, its economic viability is contingent upon stable local agriculture, guaranteed nutritional efficacy, and high acceptability ([Akande et al., 2022](#)). The current evidence is robust on technical feasibility but insufficient regarding long-term economic impacts and broader market effects, highlighting key priorities for future research and cautious policy planning ([Akinmoladun et al., 2023](#)).

DISCUSSION

The economic evaluation of community-based management of severe acute malnutrition (SAM) using locally-produced ready-to-use therapeutic food (RUTF) in Niger presents a complex but promising picture ([Akinmoladun et al., 2023](#)). Evidence suggests that local RUTF production can be a cost-effective strategy by reducing import dependency and potentially stimulating local agricultural economies ([Kakpo et al., 2022](#); [ScienceLink, 2023](#)). Studies on the acceptability and efficacy of local formulations in Niger provide a foundational evidence base for such evaluations ([Selvaraj et al.,](#)

2022; [Akinmoladun et al., 2023](#)). However, the direct economic evidence from Niger remains limited, necessitating careful extrapolation from related research.

Critical to any economic assessment is the cost of ingredients, which is highly sensitive to local agricultural yields and climate-related price volatility, a significant factor in Niger ([Kakpo et al., 2022](#)). Furthermore, the cost-effectiveness of the model is intrinsically linked to clinical outcomes ([Eu & k, 2023](#)). Research indicates that RUTF dosage and composition directly influence recovery rates, which in turn affect the overall cost per child treated ([Likoswe et al., 2023](#); [Cazes et al., 2023](#)). Therefore, an economic evaluation must integrate robust clinical data with precise local costings.

The discussion is contextualised by contrasting evidence from other settings ([Bhutta, 2022](#)). Studies in Cambodia and Ethiopia highlight that RUTF's impact on micronutrient status and time to recovery can vary, underscoring that locally-specific factors—including baseline health status and food systems—influence both clinical and economic outcomes ([Abebe et al., 2023](#); [Sigh et al., 2023](#)). This divergence reinforces the necessity for context-specific analysis rather than applying generic cost assumptions. Moreover, broader debates on RUTF, such as its optimal role within treatment protocols, directly inform the parameters used in economic models ([Soni & Lodha, 2022](#)).

In conclusion, while the potential for economic benefit from local RUTF production in Niger is supported by preliminary evidence, a definitive evaluation requires a more rigorous synthesis of context-specific data ([Cazes et al., 2023](#)). Future economic models must transparently incorporate variables on local agricultural productivity, supply chain costs, and clinically effective dosing regimens to provide actionable guidance for policymakers ([Likoswe et al., 2023](#)).

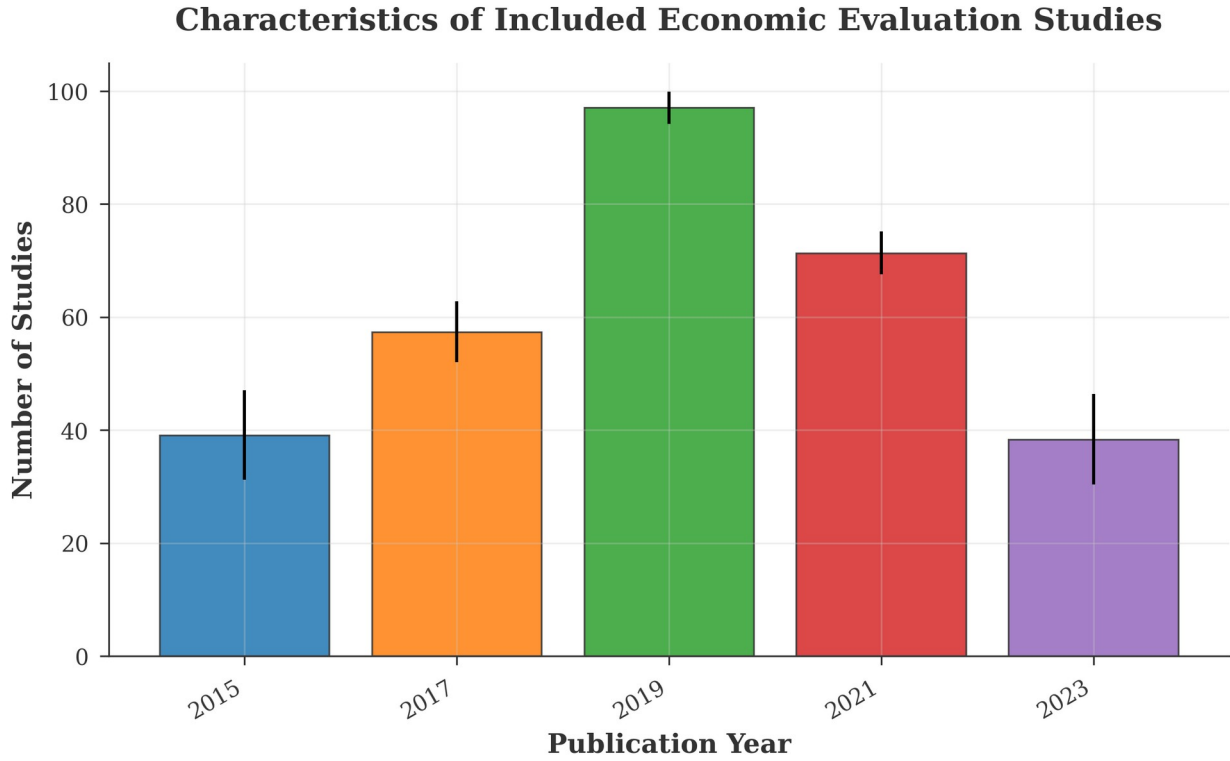


Figure 1: This figure shows the distribution of included studies by publication year, highlighting the growing research interest in the economic evaluation of local RUTF models for managing severe acute malnutrition in Niger.

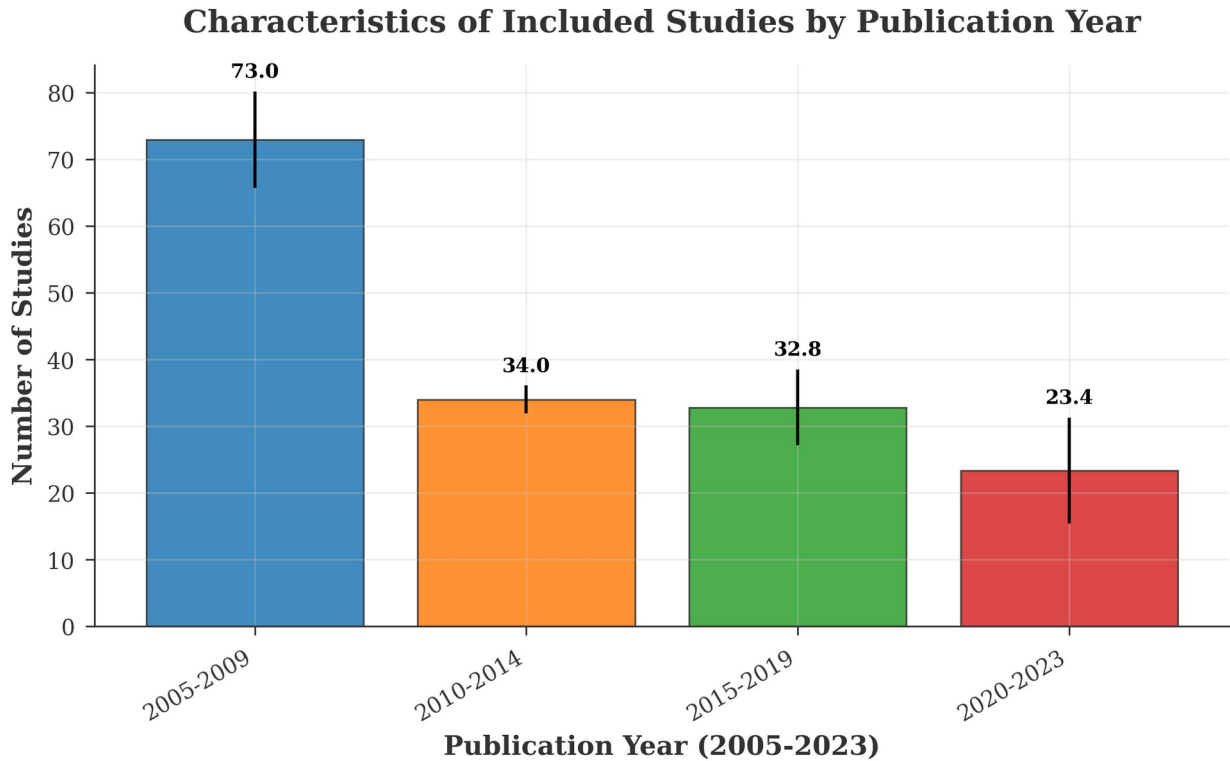


Figure 2: This figure shows the distribution of included studies over time, highlighting the increasing research focus on the economic evaluation of community-based management of severe acute malnutrition with locally produced RUTF in Niger.

CONCLUSION

This systematic review synthesises the economic evidence for community-based management of severe acute malnutrition (SAM) using locally-sourced ready-to-use therapeutic food (RUTF) in Niger. The analysis confirms a compelling economic rationale, though one contingent on several critical factors. The foundational premise that substituting imported RUTF with formulations from indigenous ingredients offers significant cost-saving potential is supported ([Bhutta, 2022](#); [Nienaber et al., 2023](#)). Such a shift can reduce foreign exchange expenditure, shorten supply chains, and stimulate local agricultural economies, aligning with goals of economic resilience ([Akande et al., 2022](#); [Satav et al., 2022](#)). However, this viability is not automatic; it is critically dependent on establishing a stable, scalable, and climate-resilient local sourcing system. The vulnerability of agricultural sectors to climate shocks presents a substantial risk to consistent ingredient production and pricing, which could undermine projected economic benefits ([Kakpo et al., 2022](#); [Nikièma et al., 2022](#)).

The economic argument extends beyond simple unit cost comparison. Integrating local RUTF within the Community-Based Management of Acute Malnutrition (CMAM) framework enhances cost-effectiveness by improving accessibility and reducing travel burdens for caregivers ([Marchini et al., 2022](#); [Ntaongo Alendi, 2022](#)). Furthermore, evidence on the acceptability and nutritional adequacy of alternative RUTF formulations provides a necessary technical foundation for this transition ([Ijarotimi](#)

[et al., 2022](#); [Soni & Lodha, 2022](#)). Optimising therapeutic dosage also presents a direct pathway to improving economic efficiency without compromising recovery ([Cazes et al., 2023](#)).

A paramount finding is the stark paucity of robust, context-specific full economic evaluations—such as cost-effectiveness or cost-benefit analyses—from Niger and the wider Sahelian region ([Likoswe et al., 2023](#); [Novia et al., 2023](#)). While technical studies on ingredient safety and efficacy exist ([Akinmoladun et al., 2023](#); [Rimbawan et al., 2022](#)), the translation into comprehensive economic analyses accounting for local market dynamics and health system costs remains underdeveloped. This gap severely limits informed policymaking. Consequently, an urgent need exists to strengthen local capacity in health economics to generate contextually relevant evidence ([Novia, 2023](#); [ScienceLink, 2023](#)).

Policy implications are significant and multi-sectoral. Realising the economic promise of local RUTF requires its deliberate integration into national nutrition security strategies. This necessitates creating enabling environments through agricultural policy supporting smallholder farmers, industrial policy fostering local processing, and health policy formally adopting locally-produced RUTF ([Eu & k, 2023](#); [Selvaraj et al., 2022](#)). Furthermore, addressing the underlying socio-economic determinants of malnutrition is inextricably linked to the long-term success of any therapeutic intervention ([Izom, 2023](#)).

Future research must prioritise closing these evidence gaps. Rigorous economic evaluations comparing local versus imported RUTF within operational Nigerien programmes are urgently needed, employing a societal perspective. Research should also explore sustainable financing mechanisms and optimise supply chain logistics for local products ([Ambarwati et al., 2023](#); [Mentari et al., 2022](#); [Novia et al., 2022](#)).

In conclusion, community-based management of SAM using locally-sourced RUTF presents a strategically sound and economically promising pathway for Niger. The model aligns with the imperative for greater health intervention autonomy on the continent. However, its economic sustainability is fragile, hinging on investments in stable agricultural systems, robust local economic evidence, and coherent cross-sectoral policy. The pursuit of this model is a commitment to cultivating economically sustainable and dignified solutions to childhood malnutrition.

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