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Innovative enrichment: Assessing moringa and spirulina as alternatives to industrial premixes used in nutrition programs in Africa

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Introduction

Across sub-Saharan Africa, infants and young children rely on cereal-based complementary foods that often fail to meet their nutritional needs, leading to deficiencies in key nutrients. Poor diet, combined with frequent infections, contributes to growth faltering and micronutrient deficiencies during early childhood. Fortifying these flours with imported vitamin-mineral premixes is a key strategy to combat micronutrient deficiencies. Yet for the region’s small and medium enterprises (SMEs) producing fortified porridges, these premixes come with hard-currency payments, volatile prices and long procurement lead-times, undermining the viability and therefore the reach of local fortification programmes.

Methods

This three-part study includes:

- 1) theoretical estimates of the potential of moringa- and/or spirulina-enriched complementary foods in meeting the nutrients requirement of young children aged to 6-24 months in Chad;
- 2) a scoping review of the effectiveness of supplementation or enrichment with moringa and/or spirulina on nutrition and health of young children; and
- 3) a field cost-and-feasibility assessment of the moringa and spirulina value chains in Chad.

Why this matters

- Imported vitamin-mineral premixes are effective but expose African SMEs to foreign-exchange risk, price volatility and long lead-times — a combination that makes **SME-led fortification programmes practically unworkable**
- **Moringa leaves and spirulina** are nutrient-rich, drought-resilient, and locally produced, offering a sustainable, food-based approach to improve the nutritional quality of complementary foods.
- **Could moringa and spirulina partially replace premix while stimulating local value chains?**

What we did

Part I - Estimates of nutrient contribution (6-24 months of age)
Modelled nutrient contribution of 5% inclusion of moringa or spirulina, and a 2.5% moringa-2.5% spirulina mix in standard cereal-legume infant flour, compared to premix fortification.

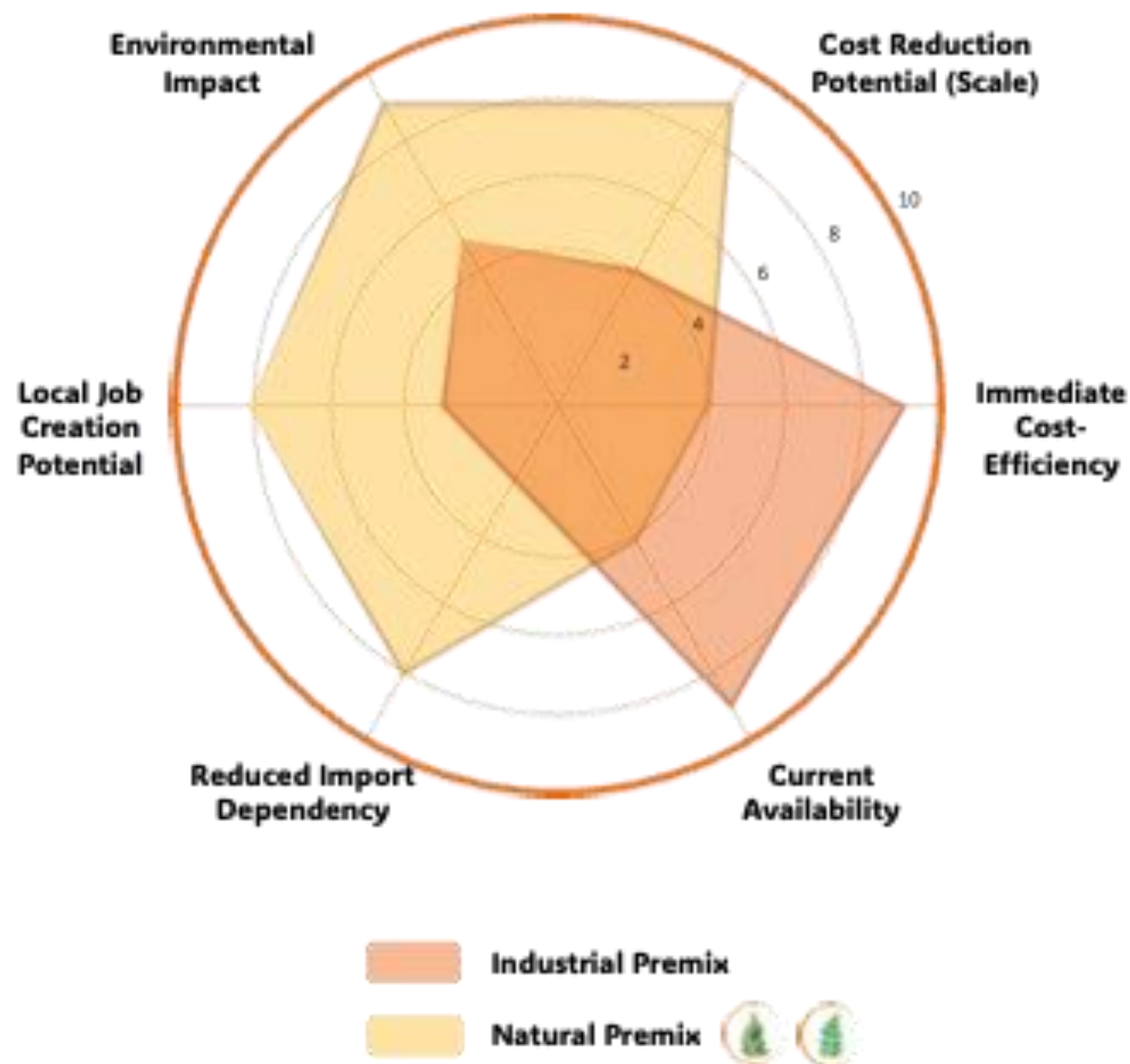
Part II - Scoping review

Screened 2 373 records → 17 eligible studies on effects of moringa- and spirulina-enriched or supplemented cereal-based foods on young children’s nutritional status and overall health.

Part III - Chad case study

- 28 key-informant interviews + field cost survey (Nov 2024)
- Compared two cost scenarios for 10 kg composite flour:
 - Industrial premix (1 %)
 - Natural blend (1 % = 50% moringa and 50% spirulina)

COMPARISON OF PREMIXES: INDUSTRIAL VS NATURAL



Key findings

Dimension	Industrial premix (<i>MANISA premix-enriched porridge</i>)	Natural blend (<i>2.5% moringa + 2.5% spirulina</i>)
Coverage of key micronutrients*	Meets nutrient needs	Improves iron, vitamin A and folate density but deficiencies in zinc, iodine and vitamin D remain
Incremental cost / kg flour	+0.02 %	At 1%: +8 – 10 % (current small-scale prices)
FX/import exposure	High	Nil
Climate footprint	High (synthetic, shipping)	Low (solar-dried crops)
Effects on child nutrition and health**	Strong evidence on anemia and iron status	No to positive effects on hemoglobin; no to negative effects on height; moringa well accepted but low adherence; spirulina data sparse

*Based on comparison of EAR coverage

**No studies to date have evaluated the combined effects of moringa and spirulina enrichment on child outcomes.

Implications for programmes and policy

1. **Nutrition** - moringa/spirulina can improve the nutrient density of cereal-based porridges, but are insufficient to meet young children’s requirements. Combining them with complementary, nutrient-rich ingredients may enhance effects, though the evidence on health outcomes remains limited, particularly for spirulina.
2. **Sustainability** - supporting climate-resilient crops aligns with EU Green Deal and Farm-to-Fork strategies.
3. **Economics** - local blend currently 8 to 10times more expansive than premix; price would fall once value chains are efficient, key infrastructures (roads, transport) and quality control laboratories are established.
4. **Gender and livelihoods** - More than 70 % of spirulina producers are women’s groups; formal cooperatives and controlled drying could increase net margins.

Take-home messages

Premix remains the most cost-effective and complete solution today.

However, blends using moringa and spirulina show promise for partial enrichment and improved local economic resilience, provided value-chain bottlenecks are addressed and product acceptability is confirmed.

Next steps: Develop locally acceptable formulations combining moringa, spirulina and other nutrient-rich ingredients like peanut flour. Rigorously evaluate these formulations through community-based trials with detailed dietary assessments to assess their impact on child nutrition and health. Invest in value chain development, infrastructure, and regional standards for natural fortifiers.

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