IJCRT.ORG ISSN : 2320-2882

INTERNATIONAL JOURNAL OF CREATIVE RESEARCH THOUGHTS (IJCRT)
An International Open Access, Peer-reviewed, Refereed Journal

From Inferior To Superior Goods: The Nutritional Revaluation Of Traditional Food Grains

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ABSTRACT

Traditional grains such as millets, pulses, and coarse cereals, historically classified as inferior goods due to negative income elasticity, have undergone a profound revaluation in the 21st century. This transformation stems from robust scientific evidence highlighting their superior nutritional profiles—high in protein, fiber, and micronutrients—coupled with climate resilience and sustainability benefits. Drawing on secondary data from 2010–2025, including FAO Food Balance Sheets, ICMR-NIN databases, National Sample Survey (NSS) rounds, and policy documents, this study analyzes consumption trends, policy impacts, and market dynamics in India and globally. Key findings include India's millet production rising from 11.41 million tonnes (2010) to 17.96 million tonnes (2021), per capita pulse consumption stabilizing at 19.6 kg (2021–22), and quinoa's market surging to USD 79.83 billion (2024). Initiatives like the International Year of Millets (2023) and India's Millet Mission have reversed decline trends, positioning these grains as superior alternatives to refined cereals. This reclassification challenges classical economic theory, demonstrating how knowledge-driven preferences and institutional support elevate traditional foods, with implications for food security, public health, and sustainable agriculture aligned with SDGs 2, 3, and 13.

KEYWORDS: Millets, Pulses, Inferior Goods, Nutrition Transition, Sustainable Agriculture, Income Elasticity, Food Security, Policy Interventions

1. INTRODUCTION

Economic theory classifies inferior goods as commodities with negative income elasticity, meaning consumption decreases as income rises, with households switching to normal or superior alternatives (Varian, 2014). Throughout the 20th century, millets (such as pearl millet, finger millet, and sorghum) and pulses (including lentils and chickpeas) exemplified this category in developing countries like India, where they were dismissed as “poor man’s food” and “poor man’s meat” due to their ties with rural poverty and limited market access (Basavaraj et al., 2010). The Green Revolution (1960s–1980s) intensified this trend by focusing subsidies, public procurement, and irrigation on rice and wheat, resulting in an 87% drop in per capita millet consumption—from 30.9 kg in 1960 to 3.9 kg in 2022 (Ministry of Agriculture & Farmers Welfare, 2024). This broader nutrition transition, marked by a rising preference for refined staples, ultra-processed foods, and animal-source proteins, worsened micronutrient deficiencies despite increasing average incomes (Pingali, 2015).

Between 2010 and 2025, however, a paradigm shift occurred in how traditional grains were valued. Scientific research underscored millets' low glycemic index (40–70) and high micronutrient content—for example, finger millet contains about 344 mg of calcium per 100 g—while pulses provide 18–25% plant-based protein and contribute nitrogen-fixing properties that improve soil fertility and sustainability (Kaur et al., 2024; Havemeier et al., 2017). Concurrent global health challenges—such as approximately 537 million people living with diabetes worldwide—and growing climate vulnerabilities increased demand for nutrient-rich, climate-resilient grains (WHO, 2023). Policy initiatives, including the UN’s International Year of Pulses (2016) and International Year of Millets (2023), along with India’s National Millet Mission (2018), formalized this revaluation, elevating these grains from marginal subsistence crops to recognized nutri-cereals within national dietary guidelines.

2. OBJECTIVES:

- To examine the historical evolution of millets and pulses from ‘inferior goods’ to nutritionally superior commodities using economic demand theory and income elasticity trends.
- To analyze the nutritional profiles of millets, pulses, and coarse cereals through scientific evidence, highlighting their health benefits, micronutrient density, and comparative advantages over refined cereals.
- To study the production, consumption, and market trends of traditional grains from 2010–2025 using secondary data from FAO, NSS, Ministry of Agriculture, and global databases.
- To evaluate the role of national and global policy interventions—such as the National Millet Mission, International Year of Pulses (2016), and International Year of Millets (2023)—in driving the revaluation and market transformation of traditional grains.

3. SIGNIFICANCE OF THE STUDY

This study is significant as it explains how traditional grains—millets and pulses—have shifted from being classified as inferior goods to becoming nutritionally and economically superior foods in modern diets. It highlights their scientific advantages in terms of micronutrient density, glycemic response, and sustainability, offering strong evidence for their role in addressing malnutrition and rising lifestyle diseases. By analyzing production and consumption trends from 2010–2025, the study provides crucial insights into changing consumer preferences and the reversal of income elasticity. The research also evaluates the impact of major policy interventions, including the National Millet Mission (2018) and UN-led initiatives, which have revived traditional grain value chains and enhanced farmer livelihoods. Overall, the study contributes to food policy, agricultural diversification, and public health by demonstrating how these grains support key Sustainable Development Goals, particularly nutrition security, climate resilience, and sustainable agriculture.

4. METHODOLOGY:

This study is based entirely on secondary data and adopts an interdisciplinary approach covering the period 2010–2025. Nutritional information was obtained from ICMR–NIN (2023), USDA FoodData Central (2024), and FAO/INFOODS (2024), while consumption and production trends were derived from NSSO (2014–2023) and FAO Food Balance Sheets (2024). Policy insights were gathered from documents by the Ministry of Agriculture & Farmers Welfare (2024) and FAO (2023), supplemented with global trade statistics from WITS and Data Bridge Market Research (2024). Peer-reviewed studies indexed in PubMed and Web of Science (2010–2025) further enriched the dataset.

Quantitative analysis employed time-series techniques to examine per capita consumption and production trends—such as the increase in millet output from 11.41 million tonnes (2010–11) to 17.96 million tonnes (2020–21)—and conducted nutrient comparisons supported by meta-analytic evidence. Qualitative analysis utilized thematic review of relevant case studies, including India's Millet Mission, the International Year of Pulses (2016), the International Year of Millets (2023), and the global quinoa market transformation.

5. RESULTS AND DISCUSSION

5.1 NUTRITIONAL PROFILES AND HEALTH BENEFITS

Millets and pulses consistently outperform refined cereals in macro- and micronutrient density, forming the scientific foundation for their recent revaluation as superior foods. Millets provide approximately 60–65%

complex carbohydrates, 7–12% protein, and 6–12% dietary fibre, along with high levels of iron, calcium, zinc, magnesium, and B-complex vitamins. Pearl millet contains about 16.9 mg of iron per 100 g, making it one of the richest plant-based iron sources and particularly relevant for addressing global anaemia, which affects over 1.2 billion people (WHO, 2023). Finger millet offers around 344 mg of calcium per 100 g, nearly 35 times higher than polished white rice, making it an unparalleled non-dairy calcium source (Shobana et al., 2013).

From a metabolic standpoint, millets possess a low glycaemic index (GI 40–70), which slows carbohydrate absorption, enhances insulin sensitivity, and moderates post-prandial glucose spikes. Clinical trials demonstrate that replacing refined cereals with millets can reduce post-meal blood glucose levels by 10–12%, contributing to better glycaemic control among individuals with prediabetes or diabetes (Kaur et al., 2024). Their high polyphenol and antioxidant content reduces oxidative stress and inflammatory markers—key risk factors for cardiovascular diseases. Additionally, their naturally gluten-free composition makes them safe for individuals with celiac disease and gluten intolerance.

Pulses complement millets nutritionally by providing 18–25% high-quality plant protein, nearly double that of most cereals, alongside 10–25% fibre and essential micronutrients such as folate, zinc, potassium, and magnesium. Their resistant starch content promotes gut health by enhancing short-chain fatty acid (SCFA) production, particularly butyrate, which supports colon integrity and reduces inflammation. Regular pulse consumption has been associated with a 5 mg/dL reduction in LDL cholesterol, improved satiety, and modest reductions in systolic blood pressure, according to clinical evidence synthesised by Havemeier et al. (2017). These attributes support the prevention of non-communicable diseases (NCDs), including cardiovascular diseases, obesity, and type-2 diabetes.

Comparatively, quinoa—a pseudo-cereal widely consumed as a global superfood—provides 14 g of complete protein per cooked cup, containing all nine essential amino acids. While quinoa is valued for its amino acid balance and mineral composition, millets outperform it in terms of affordability, dietary fibre, environmental resilience, and compatibility with Indian agro-ecological zones. Both millet and quinoa maintain a low glycaemic index (~53), offering sustained energy release and making them suitable for weight management and metabolic health (Two Brothers India Shop, 2023; Yummy Valley, 2025).

Importantly, millet–pulse combinations produce complete proteins, as millets are rich in methionine while pulses supply lysine, balancing each other's amino acid limitations. This synergy aligns with the EAT–Lancet Commission's recommendations for healthy, sustainable dietary patterns that rely more on plant-based proteins to reduce environmental pressures (Willett et al., 2019).

Comparative nutrient profiles from ICMR–NIN (2023) and USDA Food Data Central (2024) consistently show that millets and pulses exceed refined cereals in protein, fibre, iron, and calcium content. Finger millet stands out for calcium density, while chickpeas lead in fibre content, reinforcing their role as nutrient-dense staples suitable for comsbating micronutrient deficiencies and improving public health outcomes.

Grain/Legume	Protein (g)	Fiber (g)	Iron (mg)	Calcium (mg)	Magnesium (mg)	Zinc (mg)	Glycemic Index	Bioavailable Protein %
Millets								
Pearl Millet	10.6	1.3	16.9	38	114	1.7	52-68	68
Finger Millet (Ragi)	7.3	3.6	3.9	344	65	3.1	55-68	72
Foxtail Millet	12.3	8.0	1.1	31	89	2.1	42-54	71
Sorghum	10.0	4.0	2.6	54	165	1.8	48-71	65
Little Millet	7.7	7.6	9.3	17	75	2.4	50-65	70
Barnyard Millet	6.2	10.1	15.0	20	82	1.5	48-62	69
Pulses								
Soybeans (cooked)	10.6	6.0	5.1	102	65	1.9	18	92
Green Lentils (cooked)	8.8	7.9	3.3	19	48	1.2	32	85
Chickpeas (cooked)	7.6	7.6	2.9	49	48	1.7	28	78
Red Lentils (cooked)	7.7	7.9	3.3	21	50	1.3	21	84
Common Cereals								
White Rice (polished)	2.7	0.4	0.3	10	12	0.6	73	45
Wheat (refined)	9.8	1.5	1.2	34	47	1.1	75	52
White Bread	8.2	1.5	0.8	31	24	0.5	75	48

Source: ICMR-National Institute of Nutrition (2023); USDA FoodData Central (2024); FAO/INFOODS Food Composition Database (2024); Frontiers in Nutrition Research (2024)

Nutritional Comparison: Millets, Pulses vs. Refined Cereals (per 100g)

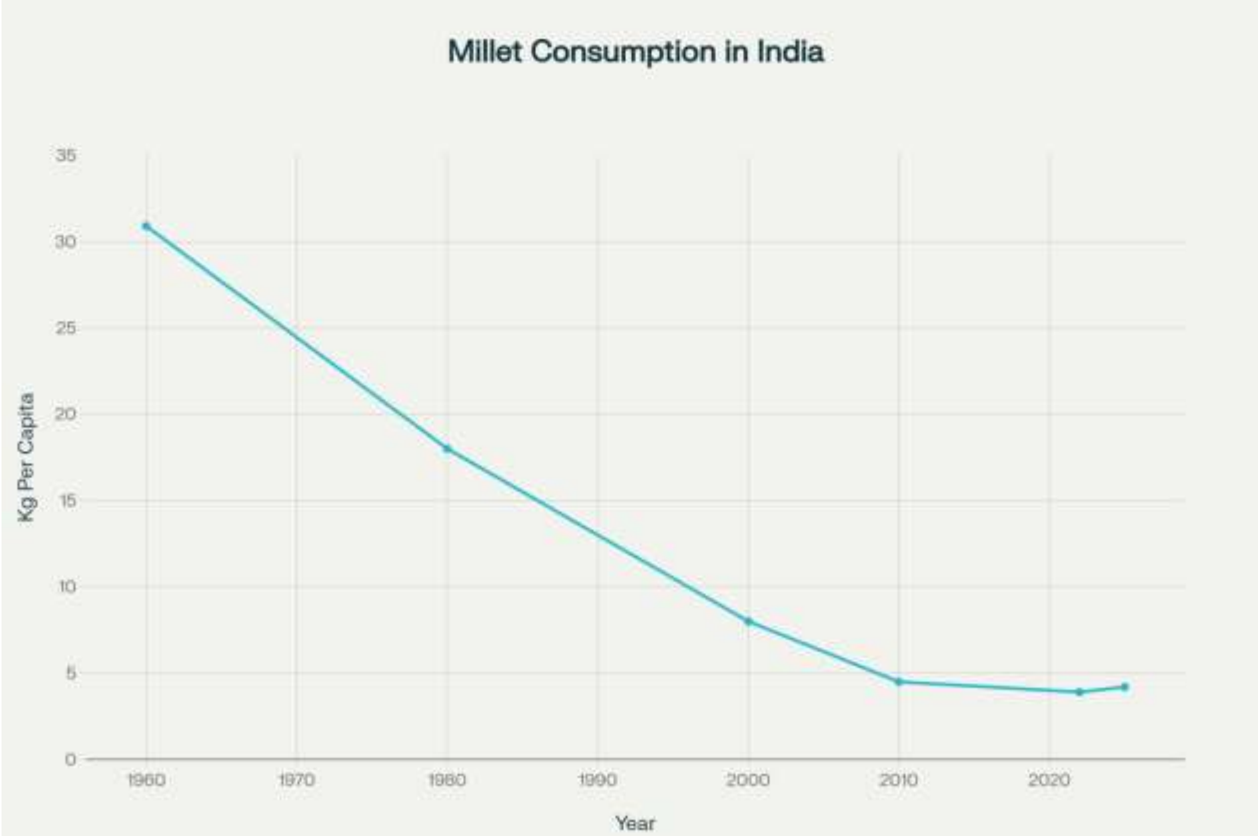
Nutritional Comparison: Millets, Pulses vs. Refined Cereals (per 100g) [ICMR-NIN, 2023; USDA FoodData Central, 2024]. This chart illustrates superior micronutrient profiles, with finger millet's calcium dominance and chickpeas' fiber leadership.

5.2. CONSUMPTION AND PRODUCTION TRENDS (2010–2025)

From 2010–2025, traditional grains showed stabilization and modest revival amid historical declines. Millet production in India grew from 11.41 million tonnes (2010–11) to 17.96 million tonnes (2020–21), with area expanding from 8.26 to 8.49 million hectares by 2022–23, driven by yield improvements (3.72% growth for small millets, 2011–2023) and policy incentives (Devi et al., 2024; Tonapi et al., 2015). Per capita consumption bottomed at 3.9 kg (2022) but recovered to 4.2 kg (2025 estimate), with urban affluent segments leading adoption (91% citing health benefits) (Kane-Potaka et al., 2021). Rajasthan (32% share) and Uttar Pradesh (18%) dominate production, reflecting climatic suitability (Agriculture Journal, 2023).

Pulse production surged 40% from 18.24 million tonnes (2010–11) to 25.46 million tonnes (2020–21), with per capita availability rising from 15.5 kg (2018–19) to 19.6 kg (2021–22), though still below 80 g/day recommendation (NITI Aayog, 2025; ARCC Journals, 2024). Consumption met only 50% of needs in high-producing districts, linked to affordability and accessibility (Gulati et al., 2020). Globally, pulses output hit 107 million tonnes (2020), up from 64 million (2000), with India as top producer (25% share) but importer (14%) due to demand gaps (Directorate of Pulses Development, 2024).

Per Capita Millet Consumption in India (1960–2025): Decline and Recovery [NSSO, 2014–2023; Ministry of Agriculture, 2024]. The line chart highlights the Green Revolution's impact (1960–1980 decline) and post-2015 revival, with production stabilizing at 11.8–17.24 million tonnes (2024).



Per Capita Millet Consumption in India (1960–2025): Decline and Recovery

5.3 POLICY INTERVENTIONS AND GLOBAL INITIATIVES

Policies from 2010–2025 catalyzed revaluation. India's National Food Security Mission-Nutri Cereals (2014) boosted millet yields, while the 2018 National Year of Millets and 2023 International Year (UN-backed by 72 nations) raised awareness, integrating millets into PDS and mid-day meals for 150 million beneficiaries (ICRISAT, 2023). Karnataka procured 0.7 million tonnes (2022–23) via Anna BhagyaYojana; Odisha's Mission reached 2.99 lakh quintals (2023–24), enhancing rural incomes (Ministry of Agriculture & Farmers Welfare, 2024).

The International Year of Pulses (2016) emphasized sustainability, spurring 2.2% annual production growth to meet 39 million tonne demand by 2050 (FAO, 2016; Indian Institute of Pulse Research, 2015). State initiatives in Tamil Nadu and Uttarakhand promoted millet festivals and recipes, reducing cultural barriers. Globally, these aligned with SDGs, positioning millets as climate-smart (one-third rice's water needs) and pulses for soil health (CGIAR, 2023). Quinoa's 2013 UN Year precedent showed market potential, with prices rising from USD 3.2/kg (2012) to USD 6.2/kg (2014) (Alandia et al., 2020).

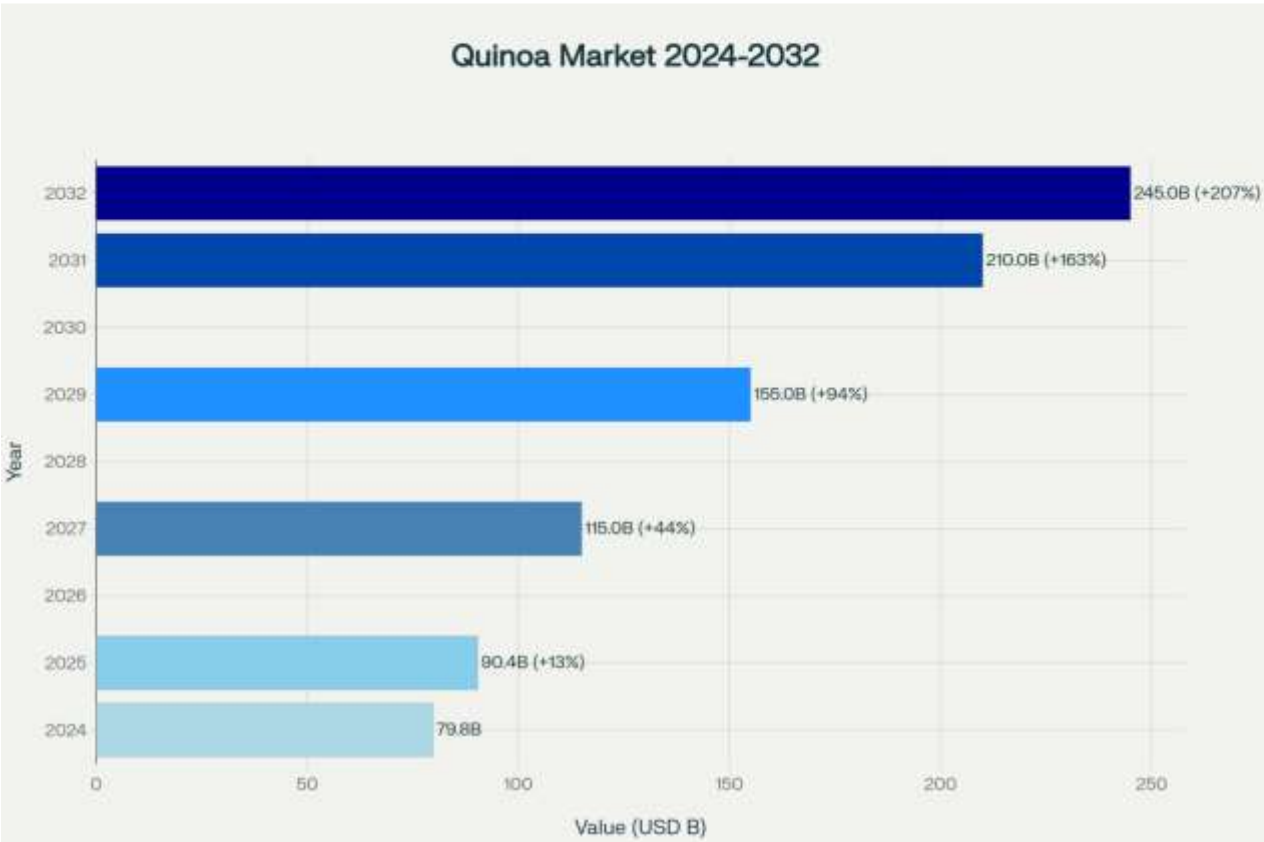
6. CASE STUDIES: MARKET TRANSFORMATIONS

6.1 QUINOA'S GLOBAL ASCENT

Quinoa's shift from Andean staple to superfood mirrors millets' trajectory. Production grew post-2013 UN Year, with market value at USD 79.83 billion (2024), projected to USD 245.01 billion (2032) at 13.27%

CAGR (Market Data Forecast, 2025). Unlike millets' fiber focus for digestion, quinoa's complete proteins (all nine amino acids) and minerals (iron, magnesium) support muscle repair and bone health, with low GI (~53) aiding weight loss (India Today, 2025). Its premium pricing (USD 5/kg stabilized) targets fitness enthusiasts, contrasting millets' affordability for everyday diets (Organic Gyaan, 2025).

Global Quinoa Market Expansion (2024–2032): CAGR 13.27% [Maximize Market Research, 2025; DataBridge Market Research, 2024]. This horizontal bar chart depicts explosive growth, exemplifying health-driven demand for traditional grains.



Global Quinoa Market Expansion (2024–2032): CAGR 13.27%

6.2 INDIA'S INTEGRATED REVIVAL

India's Millet Mission integrated procurement, processing, and awareness, stabilizing production at 17.24 million tonnes (2024) despite area contraction (from 35 million ha in 1950s to 13.6 million ha in 2020) (Crop Science, 2024). Pulses saw volatile growth (–11% in 2014–15 to +40% in 2016–17), with self-sufficiency efforts closing import gaps (Directorate of Pulses Development, 2024). Urban surveys show 50%+ households increasing millet intake for NCD prevention (Singh &Vemireddy, 2023).

7. ECONOMIC RECLASSIFICATION AND IMPLICATIONS

Historically negative income elasticity for millets/pulses has reversed among urban elites, where higher incomes correlate with increased consumption for health/sustainability values (Kane-Potaka et al., 2021). This "preference transformation" challenges Varian's (2014) model, showing endogenous shifts via knowledge and norms.

Implications span domains: nutritionally, addressing 1.9 billion micronutrient deficiencies (WHO, 2023); economically, boosting smallholder incomes (70% millet area rainfed); environmentally, reducing GHG footprints (millets 50% lower than rice); and socially, preserving heritage while aligning with SDGs (Willett et al., 2019). Challenges include equitable access—preventing luxury status—and scaling value chains.

8. LIMITATIONS AND FUTURE DIRECTIONS

Data inconsistencies persist in post-2020 rural consumption, with regional biases toward India (51% districts below median intake) (Gulati et al., 2020). Bioavailability issues (e.g., phytates in ragi) require processing innovations. Future research should track long-term NCD impacts and transfer models to Africa/Asia-Pacific, where millets cover 80% production share (Frontiers in Sustainable Food Systems, 2024).

9. CONCLUSION

The revaluation of millets and pulses from inferior to superior goods, evidenced by 2010–2025 production/consumption upturns and policy successes, underscores dynamic food systems. Driven by nutritional science, health imperatives, and sustainability needs, this shift offers pathways for equitable nutrition security. As India leads global millet output (80% Asia-Pacific share), scaling inclusive interventions will realize these grains' potential for resilient agriculture and healthier populations (ICRISAT, 2023).

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