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ijerst.editor@gmail.com

editor@ijerst.com

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# HOMOGENISATION OF CROPS FOR HUMAN CONSUMPTION – DELETERIOUS EFFECTS ON HUMAN HEALTH

*Dr. A. Sasikala*
*Lecturer in Botany*
*P.V.K.N. Government College (A)*
*Chittoor-517001*
*Chittoor (dt), Andhra Pradesh.*

**ABSTRACT:** The global food system has undergone severe homogenisation, with over 75% of human caloric intake now derived from just 12 crops and 5 animal species, predominantly high-yielding varieties of rice, wheat, and maize. This study examines the consequences of this loss of agrobiodiversity for human health. Historically, human diets encompassed over 6,000 plant species, providing diverse micronutrients, phytochemicals, and dietary fiber. The shift to monoculture staples has led to a nutritionally impoverished food supply, characterized by high starch and low mineral density. We review evidence linking crop homogenisation to three critical health outcomes: 1) hidden hunger, with iron, zinc, and vitamin A deficiencies affecting 2 billion people, 2) loss of gut microbiome diversity due to low fiber diversity, increasing incidence of metabolic syndrome, autoimmune disorders and allergies, and 3) heightened vulnerability to food system shocks and increased exposure to pesticide residues and gluten-related disorders. The paper argues that de-homogenisation through revival of millets, pulses, and indigenous landraces is essential for nutritional security and long-term public health resilience

**KEY WORDS:** Homogenisation, Agrobiodiversity, vitamin deficiency, millets, indigenous crops.

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## 1. Introduction

For 12,000 years, humans domesticated over 6,000 plant species. In 2024, humans cultivate fewer than 200 at scale. The Green Revolution of the 1960s achieved its goal: it averted famine by doubling cereal yields. However, it inadvertently created a new crisis. We now produce 20% more calories than needed to feed the world, yet 2 billion people are micronutrient deficient and 3 billion cannot afford a healthy diverse diet. This is the paradox of homogenisation.

Homogenisation is defined as the process by which diverse, locally adapted farming systems are replaced by a small number of high-yielding, genetically uniform varieties grown globally.

## 2. Extent of Homogenisation

| Indicator | 1961 | 2020 | Change |
|---|---|---|---|
| Share of rice, wheat, maize in total calories | 42% | 60% | +43% |
| Plant species contributing 90% of food supply | 27 species | 15 species | -44% |
| Area under millets in India | 37 M ha | 13.5M ha | -63.5% |

In Andhra Pradesh and Rayalaseema region, traditional varieties like Korra [foxtail millet], Sama [little millet], and red sorghum that dominated Chittoor district in 1970s have almost vanished from markets.

**2.1. Local Context: Status of Crop Diversity in Chittoor District, Andhra Pradesh**

To understand homogenisation at a grassroots level, a brief field observation was conducted in Chittoor rural, Piler, and Bangarupalemmandals. Information was collected through informal interaction with 15 elderly farmers and local mill owners.

Table 1: Traditional Millets and Indigenous Crops of Chittoor Region - Decline and Nutritional Value (2025)

| S. NO. | English name | Telugu local name | Scientific name | Status in Chittoor | Key nutritional advantage vs white rice |
|---|---|---|---|---|---|
| 1 | Finger millet | Ragi | Eleusinecoracana | Moderately available, grown in Piler | 10x more Calcium-344mg/100g, prevents osteoporosis in women |
| 2 | Foxtail millet | Korralu | Setariaitalica | Rare, earlier staple in Bangarupalyem | 3x more Iron, low GI-good for Diabetes |
| 3 | Little millet | Samalu | Panicumsumatrense | Almost vanished | Highest fibre, improves gut bacteria |
| 4 | Kodo millet | arikelu | Paspalumscrobiculatum | Vanished from markets | Rich in antioxidants, controls blood sugar |
| 5 | Barnyard millet | oodalu | Echinochloafrumentaceae | Only seen in tribal shandies | Fastest digesting millet, good for elderly |
| 6 | Pearl millet | sajjalu | Pennisetumglaucum | Available seasonally | High Iron-8mg/100g, fights anemia |
| 7 | Sorghum | jonnalu | Sorghum bicolor | Limited to border areas | Gluten-free, rich in protein |
| 8 | Indigenous Paddy | Konda vadlu | Oryza sativa-Local landrace | Lost-replaced by BPT 5204, SonaMasuri | Contains anthocyanin, not polished, retains bran |

Key Observation from Chittoor:

In 1980s, every household in Chittoor rural stored at least 3 types of millets for daily consumption.In 2025, 12 out of 15 households surveyed consumed only BPT 5204 polished white rice and wheat chapati daily.Farmers reported that market price for Korralu is Rs. 70/kg vs White rice Rs. 40/kg from PDS, so economic compulsion drives homogenisation.Traditional recipes like Korra Annam, RagiSangati with Gongoora, Samalu Pongal are now eaten only during festivals, not daily.

**Link to health:**

Local PHC data [Primary Health Centre, Chittoor rural] informally indicates rise in Type 2 Diabetes from 6% in 2010 to 14% in 2024, and anemia in adolescent girls remains at 58%. This correlates with the shift from millet-diverse to rice-uniform diet.

This local evidence confirms the national trend documented by FAO and Khoury et al. and establishes that homogenisation is not just a global statistic but a reality in Chittoor district itself.[2019][2014]

**3. Pathways of Health Damage**

**3.1. Pathway 1: Nutrient Dilution Effect**

Modern breeding focused on starch yield, not nutrient density. This is called the "dilution effect."

**100g comparison**:

- **Polished White Rice**: 130 kcal, 0.2mg Iron, 0.4g Fiber, 0mg Calcium
- **Foxtail Millet**: 331 kcal, 2.8mg Iron, 6.7g Fiber, 31mg Calcium
- **Finger Millet**: 336 kcal, 3.9mg Iron, 3.5g Fiber, 344mg Calcium

A person eating 400g of polished rice as staple loses 90% of potential fiber and 80% of minerals compared to a millet-based diet. This directly causes anemia, osteoporosis, and constipation, rampant in rice-dominant populations.

**3.2. Pathway 2: Phytochemical Extinction**

Beyond vitamins, traditional crops contained thousands of bioactive compounds - polyphenols, flavonoids, anthocyanins, lignans. These act as natural anti-inflammatories and anti-cancer agents.

Example: Black rice contains anthocyanin [same as blueberry], red jowar contains 3-deoxyanthocyanins which inhibit colon cancer cell growth.

Loss of these compounds weakens the body's antioxidant defense system, leading to chronic low-grade inflammation - the root of all NCDs.

**3.3. Pathway 3: Gut Microbiome Collapse - The Most Critical Effect**

This is the most recent and alarming finding. The human gut contains 38 trillion bacteria. Their diversity depends on dietary diversity.

**Research by Stanford Sonnenburg Lab**:

- Participants eating diverse traditional diet [>30 plant types/week] had microbiome diversity score of 8.5
- Participants eating homogenised western diet [ <10 plant types/week] had score of 4.2
- Low diversity = high risk of diabetes, obesity, depression, and inflammatory bowel disease.[2019]

Homogenised crops provide only soluble starch which feeds only a few bacterial strains. Diverse millets provide resistant starch, arabinoxylan, beta-glucan - each feeds different beneficial bacteria which produce Butyrate, a molecule that heals gut lining and regulates blood sugar.

**3.4. Pathway 4: Metabolic Syndrome Acceleration**

Refined homogenised grains have high Glycemic Index [GI] and Glycemic Load [GL].

GI Chart:

- Foxtail millet: 50
- Brown rice: 55
- Whole wheat: 62
- White rice: 73
- Polished wheat flour: 75

Chronic high GI diet causes hyperinsulinemia, leading to Type 2 Diabetes. ICMR data shows diabetes prevalence in states with highest rice-wheat dependence is 11.2% vs 5.8% in millet-consuming tribal districts.

Furthermore, overexposure to gluten from continuous wheat consumption has led to a 400% rise in gluten intolerance and celiac disease diagnosis in India in last 10 years.

**4. Ecological and Mental Health Dimensions**

Loss of crop diversity also causes loss of culinary diversity, cultural identity, and mental well-being. Traditional food systems were tied to festivals and seasons, providing psychological resilience. The homogenised diet is linked to higher rates of food-related anxiety and loss of traditional food knowledge among youth.

**5. Solutions: The De-homogenisation Framework**

**A. At Policy Level:**

- Expand PDS beyond rice-wheat to include ragi, jowar, bajraas done by Karnataka and Odisha Millet Mission.
- Implement True Cost Accounting - subsidize not just yield but nutritional output per acre.

**B. At Farm Level:**

- Promote 3-tier model: Main crop + intercrop + border crop. Eg: In Chittoor, Mango + Ragi + Red Gram.
- Community Seed Banks to preserve landraces like Chittoor's native 'GiddaluVadlu' paddy.

**C. At Consumer Level:**

- Adopt the 30-plant rule: Aim to eat 30 different plant species per week, including leaves, tubers, seeds.
- Rediscover forgotten foods: In your region - Gogu, ChiruDhanyalu, Gangavalli Kura.[Roselle]

**6. Conclusion**

The homogenisation of crops was an agricultural success but a nutritional catastrophe. The future of human health depends not on producing more of the same, but on producing more diverse foods. As Hippocrates said, "Let food be thy medicine" - but medicine works only when it is diverse. Reclaiming crop biodiversity is no longer an environmental issue; it is a clinical intervention.

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