Abstract

In the context of the diversification of food choices, millets have taken centre stage. Millets offer a number of distinguished advantages over other food grains. Driven by the recognition that millets, resilient coarse cereal crops rich in fibre, protein, and micronutrients, are beneficial for achieving Sustainable Development Goals (SDGs) like zero hunger (SDG 2) and good health (SDG 3), the study seeks to address the declining consumption of these grains.

The study began with the identification of barriers to millet adoption on a mass scale using the FBWM and FDEMATEL methods. The study analyzed barriers across production, consumption, and government policies. While less or no profitability for the farmer (B2) was ranked as the most important barrier by experts (Rank 1), the FDEMATEL analysis showed it to be an *effect* or symptom. Conversely, barriers perceived as less important, such as Lack of push from the government (B14) and Lack of supporting R&D in millets (B16), were identified as the influential causal drivers that must be addressed for long-term impact.

After identification of the critical barriers and their relationships, the next objective was to use mathematical modelling to find the optimal combination of food items to meet nutritional requirements at the minimum cost. Results demonstrated that for nutritional requirements to be met effectively, millet consumption must constitute nearly 50% of the total food intake.

The research on the utility of nudges in promoting millet consumption in PDS consumers employed Randomized Control Trials (RCTs) involving 400 PDS respondent households in a peri-urban town in Northern India to assess the effectiveness of non-financial nudges, specifically pamphlets, in promoting millet purchasing behavior. The study confirmed that carefully designed nudges, addressing barriers like lack of health awareness and poor perception, significantly increase the willingness to consume millets. Notably, recipe-focused information proved to be the most influential intervention.

Finally, to include the millets in PDS supply chain efficiently, a facility location model was developed to identify optimal locations for warehouses to efficiently distribute millets from source storage to FPS shops via warehouses for the PDS supply chain. Optimizing the use of existing warehouses resulted in a decrease in millet transportation costs. The model was applied to various realistic scenarios and planned capacity constraints. resulting in an optimally balanced distribution of millets.

Synthesizing findings, the research delivers evidence-based policy recommendations: strengthen R&D incentives, diversify food consumption basket, scale behavioral interventions, and deploy data-driven logistics. These interventions promise nutrition-sensitive PDS transformation, supporting Viksit Bharat 2047 goals. Limitations include regional focus and short-term RCT horizons; future work could explore longitudinal impacts and multi-state scaling.

Keywords: Millet, Public Distribution System, Mathematical Modelling, Facility Location Problem, Randomised Control Trial, FBWM, DEMATEL.