

Urban Dietary Shifts vs. Traditional Crops: Socioeconomic Drivers of Millet Decline and Revival Policies in Nepal

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Abstract: The paper seeks to understand the socioeconomic forces that have led to the current eradication of traditional millet production in Nepal in the face of the fast-growing urbanization and changing food habits and also how effective the current policies of revival are. Using mixed-methods research that consists of household surveys in 12 rural districts, policy analysis, and urban consumption data we demonstrate three dominant forces marginalizing millet; (1) dietary globalization to urban diets that favour rice and wheat; (2) dietary stigmatization of the poor man millet crop among emerging middle classes; and (3) labour-intensive production activities that do not suit youth outmigration. Although Nepal has a National Millet Promotion Program in 2023, the effect of supply-side action (e.g. seed-subsidies) does not address essential demand impediments. Ironically, the same ratio (78 percent) of smallholders aforementioned abnormalities indicated that millet occupied less land than it was before 2015, which, in itself, has been loosely compared to the expansion of urban income earnings ($r = 0.72$, $p < 0.01$), although on the other hand, 61 per cent of urban dwellers revealed their intentions to pay an extra premium on nutritionally enriched millet product sales, indicating a potentially uncharted \$14.2M market potential by 20.

This gap is due to poor market integration, discontinuous value chains, and poor branding of the superfood frame of millet. We contend that policy coherence in three dimensions (economic, behavioural, institutional) is critical to successful revival (e.g. through SME partnerships in the ready-to-eat category; rebranding millet as a climate-smart, modern crop; and aligning the ag, trade, and health ministries with global food-security efforts, including the FAO International Year of Millets). The paper contextualizes the millet path in Nepal as a virtual representation of the Global South issues since urbanization is interfering with the conventional food systems and doles out a plea towards the policymakers with the help of which integration of the millet could take advantage of as an economic resource and a tool of sustainable development, whilst preserving the cultural heritage.

Keywords: Urbanization; Dietary shifts; Traditional crop decline; Socioeconomic drivers; Agricultural policy coherence



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1. Introduction

Urbanization is a phenomenon of utmost importance to global economic growth because it redefines dietary, agricultural, and rural livelihood of humans globally (Reardon et al., 2019). Global population in urban areas is expected to grow to 68 percent by 2050 (United Nations, Department of Economic and Social Affairs [UN DESA], 2022), and dietary demands dictate that even in milk producing economies, consumers are moving towards processed grains and protein rich diets, at the expense of nutrient dense, traditional crops such as millets, which has begun to challenge the biodiversity, climate adaptiveness and food sovereignty within Global South economies (Khoury et al., 2014; Pingali, 2007). Nepal is an example of this contradiction an increasing rate of urbanization (3.1% per year) is causing a change in diet that has neglected local millets native to the country and that were traditionally critical to food security in places affected by climate sensitivity to rice and wheat as higher incomes and Western influences lead to a bourgeois lifestyle (Bhusal, 2021; Reardon et al., 2020). This deterioration is taking place ironically when millets are being recognized across the globe as the food crops of the future due to their drought resistance and nutrients content (Food and Agriculture Organization [FAO], 2023).

The cultivation of millet (kodo, finger millet, foxtail) dates back thousands of years in Nepal, where it is used as food by 35 percent of the communities living in the hills and formed a mainstay of cultural traditions and ecological sustainability (Adhikari et al., 2021). Its steep downfall acreage has dropped by 42 % between 2000 and 2020 (Central Bureau of Statistics [CBS], 2022; Ministry of Agriculture and Livestock Development [MoALD], 2022) due to overlapping socioeconomic forces. Urbanization also exacerbates the stigma of millet as a crop of the poor as it increases the prestige of rice (Gartaula et al., 2017), with more than three-quarters of Kathmandu middle-income households having already discarded millet after 5 years of urban migration (Bhusal, 2021). At the same time, labour-intensive growing conditions of millet (35 percent more than hybrid rice farming) are in conflict with the youth out-migration, with a tenth of rural 15/29-year-olds leaving home on a temporary

basis (Central Bureau of Statistics [CBS], 2021). This trend is further prevalent with historical policy neglect as the agricultural subsidies favoured rice and wheat (Chapagain & Gentle, 2015), which disintegrated the value chains of millet.

As a rejoinder, the National Millet Promotion Program (2023) seeks to rebrand millet as the smart superfood with respect to climate in Nepal (Ministry of Agriculture and Livestock Development [MoALD], 2023). Nevertheless, initial evaluations indicate serious gaps in structures. The limitations of supply-side interventions (e.g. seed subsidies) are due to ignoring the obstacles to the demand, such as consumer reluctance and poor processing infrastructure (Gauchan et al., 2020; Gauchan et al., 2023). There is an urban-rural disjuncture given the fact that 61 percent of Kathmandu elites are willing to pay premium in millet products (Pandey, 2021); there is a problem in accessing the market because of logistical barriers and asymmetry of information among the smallholders (Sapkota, 2023). Misalignment of institutions that should combat revival, such as the trade, health and agriculture ministries, further pull the revival efforts back (Resnick et al., 2021).

These dynamics are made visible by means of the theoretical frameworks. The marginalization of millet may be described in terms of embeddedness provided by Polanyi (1944) and its socioeconomic institutions (North, 1990), and the Food Regime Theory explains the shift of the Nepali diet to reflect of policies favouring grain monocultures and neoliberalism (McMichael, 2019). The available literatures in the field of research lack soundness in the determination of the quantitative transaction of urbanization to the decline of millet (Timilsina et al., 2022) and lack quality assessment of policy coherence based on institutes synergy (Siddiki et al., 2019). This research fills in these gaps by using a mixed methods approach (Johnson & Onwuegbuzie, 2004) that examines Nepal millet arc, and locates it in the context of international agendas on the sustainability of agri-food revolution.

2. Literature Review

The transition in diet around the world into homogenizing staples, as a result of urbanization, rising income, and liberalization of international trade, marginalized non-homogenized staple crops

such as millets in the developing economies (Reardon et al., 2019). This classic example is set as the Westernization of Asian diets by Pingali (2007), where ash-cereals have been swapped by rice and wheat, which have seemed easy and prestigious. This is associated strongly with the rates of urbanization: Reardon et al. (2020) show that one in ten percent rise in urban population narrows conventional crop consumption by 6.2 percent in South Asia. This is seen in the case of Nepal, whereby compared to the year 2000, there has been a decrease in the amount of millet farms of 42%, emulating the increased rate of urbanization (Central Bureau of Statistics [CBS], 2022; Ministry of Agriculture and Livestock Development [MoALD], 2022). Khoury et al. (2014) ascribe such homogenization in crops to integrated market forces since they focus on high-yielding staples that eliminate agro-biodiversity and climate resilience.

Institutional dynamics as revealed in socioeconomic factors of millet decline in Nepal is complex. According to Gartaula et al. (2017), cultural stigma plays a central role in this: millet is considered a backward crop to progressive urban families who by contrast associate rice with financial gain. This is quantified by the surveys conducted by Bhusal (2021) in Kathmandu where 74 percent of the migrants forsake millet after five years of living in the city. Meanwhile, a lack of labor (outmigration of young people at 25 percent of the rural population aged 15 to 29) is compounding the issue of production due to the fact that millet is more labor intensive to produce than commercial rice varieties at 35 percent more workload (CBS, 2021; Paudel et al., 2019). Chapagain and Gentle (2015) highlight the historical bias of Nepal policy, especially because the agricultural subsidies of the 2000-2020 backdated only those referring to rice and wheat because milk value chains were not prioritized. Such neglect by institutions disintegrated supply chains which restricted access of smallholders to the market (Sapkota, 2023).

The facets of urbanization, as the contribution to the deterioration and rejuvenating agent, are poorly researched. Even as Pandey (2021) notes increasing urban demand of the so-called super foods (61 percent of the Kathmandu elites express readiness to pay a premium price to buy millet products), Sapkota (2023) highlights strategic value-chain gaps: lack of processing

infrastructure, poor branding, and logistic issues do not allow the rural producers to access urban markets. Such an urban-rural detachment is what Resnick et al. (2021) call policy incoherence, with the former (i.e., supply-side interventions, such as seed subsidies), having no correlation with the latter (i.e., demand-stimulation interventions). The 2023 National Millet Promotion Program in Nepal is an illustration of this shortcoming with its focus on farm input, but inadequate dedication to either market link to consumers or consumer awareness (Ministry of Agriculture and Livestock Development [MoALD], 2023).

In most parts of the world, model of successful millet revival focuses on institutional synergy. The National Millet Mission in India connected agricultural ministries to health initiatives and private-sector partnership (e.g. re-branding millet as Sri Anna or nutri-cereals), and raised consumption by 18 percent in metropolitan areas^[16]. Parallely, climate adaptation financing that was integrated into policy involving the development of millet value chains enhanced the incomes of smallholders of Uganda by 27 percent^[17]. The instance justifies the claim by Gauchan et al. (2020) that, to restore Nepal, it is prudent to harmonize the efforts of agriculture, trade, and work ministries so that they can take advantage of the cross-sectoral benefits of millet.

Such dynamics are clarified by theoretical frameworks. The embeddedness explanation as put forward by Polanyi (1944) provides a relevant understanding of how millet has been marginalized by socioeconomic institutions that de-contextualize food systems with respect to the cultural environment. Food Regime Theory additionally enriches this: This is because the neoliberal policy of trade favours commodity crops to supply the global markets, rather than locally rooted staples (McMichael, 2019), opines McMichael. This has taken the form of state subsidies supporting rice, a world traded product, in preference over millet in the hills of Nepal where millet is actually more climate resilient (Timsina et al., 2020).

There exist areas of critical knowledge gaps. To begin with, not many studies measure the causal effect of urbanization on millet degradation through household-level data of behaviour (Timilsina et al., 2022). Second, policy coherence indicators have not been defined, and therefore it is difficult to assess policy

coherence among institutions (Resnick et al., 2021). Thirdly, there is limited exploration of the possibility of retrofitting millet into contemporary supply chains (e.g. via SME-processed foods) ^[23]. This paper fills these gaps by using a mixed-methods field study (Johnson & Onwuegbuzie, 2004) and policy coherence analysis (Siddiki et al., 2019) of the Nepalese millet pathway.

3. Methodology

3.1 Research Design and Philosophical Approach

This research applied a sequential research design (quantitative then qualitative) that was pragmatically oriented (Johnson & Onwuegbuzie, 2004) to achieve triangulation of the socioeconomic forces, policy gaps, and market potential behind millet decline in Nepal. The study system was combined with:

- Quantitative surveys to gauge the effects of the degree of urbanization on patterns of production and consumption.
- Qualitative focus groups to investigate the behavioural drivers and institutional barriers.
- Policy document analysis to ascertain coherence of the revival strategies in Nepal.

The research involved fieldwork in the Hill and Mountain regions of Nepal (January 2024–June 2024) across 12 districts. These districts were selected because they are areas with a long history of production (> 30 percent of farmland cultivated millet before 2000) and significant exposure to urbanization (proximity to 5 major urban corridors in Nepal) (Central Bureau of Statistics [CBS], 2022; Ministry of Agriculture and Livestock Development [MoALD], 2020).

3.2 Quantitative Phase: Surveys and Sampling of the Households

The National Agricultural Census 2021 (Central Bureau of Statistics [CBS], 2022) was used as the sampling framework, founding 480 millet-growing households based on stratified random sampling along four agro-ecological strata (High Hill, Mid-Hill, Valley, Peri-urban). A structured questionnaire administered via Kobo Toolbox tablets captured:

Measurements of production: Change in acreage of millet (2000 to 2023), change in labor requirements, the trend in yield

Patterns of consumption: Dietary changes of the household (7-day recall), market participation

Socioeconomic factors Socioeconomic variables

Migration history Income sources Asset ownership

Millet acreage decrease (%) and urban market engagement index were dependent variables.

Vital independent variables included:

Index of urban influence (remittance income multiplied by distance to urban centre)

Dietary transit score (rice ratio: wheat consumption ratio)

Awareness of policy level (knowledge of subsidies)

Data analysis with the use of STATA 18.0 was done as follows:

Econometric modeling: Panel fixed-effects regression:

The following panel regression model was used to analyse determinants of millet acreage change:

$$Y_{it} = \beta_0 + \beta_1 \text{Urban_influence}_{it} + \beta_2 \text{Policy_awareness}_{it} + \beta_3 X_{it} + \alpha_i + \varepsilon_{it}$$

Where Y_{it} = acreage change for household i at time t , X_{it} = control variables (age, education, land size), and α_i = household fixed effects (Wooldridge, 2010).

Market potential was analyzed through willingness-to-pay (WTP) estimation via the contingent valuation method (Carson, 2011).

Qualitative Phase: Focus Groups and Institutional Mapping

Twelve focus group discussions (FGDs; 8–10 participants each) captured stakeholder perspectives:

Farmers ($n = 4$ FGDs): Labor constraints, market access barriers

Traders/processors ($n = 3$ FGDs): Value-chain fragmentation

Urban consumers ($n = 3$ FGDs): Consumption stigma, product preferences

Policy actors ($n = 2$ FGDs): Institutional coordination challenges

A semi-structured protocol guided all discussions. Transcripts were coded in NVivo 14 and analyzed using thematic analysis (Braun & Clarke, 2012). Concurrently, 37 policy documents (2010–2023) were analyzed via content analysis for a policy coherence assessment, evaluating alignment between agriculture, health, and trade sectors using the Institutional Grammar Tool (Siddiki et al., 2019).

Gap identification: Mismatches between program objectives (e.g., National Millet Promotion Program) and implementation resources.

3.3 Value-Chain Analysis

Field mapping of 18 millet value chains traced product flows from farmers in Dolakha (High Hill) and Palpa (Mid-Hill) to urban markets (Kathmandu, Pokhara). Metrics included:

- Post-harvest losses at aggregation points
- Price margins across supply-chain nodes

Market integration was assessed using cointegration tests between farmgate and retail prices (Ravallion, 1986).

Theoretical Framework Application

Polanyi’s (1944) concept of embeddedness guided the analysis of socioeconomic drivers (e.g., stigma), while New Institutional Economics (North, 1990) framed the policy coherence evaluation.

Validation and Ethical Considerations

Several measures were taken to ensure rigor and ethical compliance. Triangulation was achieved by cross-verifying survey trends with FGD narratives

and policy records. Member checking was conducted by validating preliminary findings with 15 key informants. The study received ethical compliance approval from the IIMS College IRB (Ref: IIMS-IRB/2024/Ag-07). In accordance with national ethical guidelines, oral consent was documented for illiterate participants (National Health Research Council [NHRC], 2021).

4. Result and Discussion

4.1 Urbanization’s Impact on Millet Production Decline

Quantitative analysis confirms urban proximity as the strongest predictor of millet acreage reduction. Households within 50 km of urban centres reduced millet cultivation by 78.2% (SD = 12.4) since 2015, compared to 41.3% (SD = 15.1) in remote areas (*p* < 0.001) (Table 1). Regression models attribute 68% of this decline to three variables:

Heat Map Data Layers

Table 1. Millet Acreage Change by Urban Proximity (n = 480)*

Buffer Zone	Colour Gradient	Acreage Loss	Sample Districts
0-50 km	Dark red (> 70%)	78.2% avg loss	Kathmandu, Dhading, Lamjung
50-100 km	Orange (60-70%)	61.7% avg loss	Palpa, Syangja, Dolakha
100-150 km	Yellow (40-60%)	41.3% avg loss	Jumla, Mugu, Humla
> 150 km	Green (< 40%)	22.9% avg loss	Bajhang, Darchula

Families within 50km of urban centres scaled down millet farming by 78.2 per cent (SD = 12.4) since 2015, as compared to 41.3 per cent (SD = 15.1) in remote locations (p < 0.001) (Table 1). This was augmented by an acute and correlated shortage of labor, as 89.1

per cent of near-urban and 52.6 per cent of remote-zone households were impacted (Table 2). Three variables are credited by regression models with 68% of this decline.

Table 2. Agricultural Metrics by Proximity to Urban Centers

Distance to Urban Center	Avg. Acreage Reduction (2015–2023)	Labor Shortage (%)
< 50 km (n = 192)	78.2% (±12.4)	89.1%
50–100 km (n = 168)	61.7% (±14.2)	73.4%
> 100 km (n = 120)	41.3% (±15.1)	52.6%

FGDs revealed labor shortages as the primary mediator: “Youth leave for cities; only elders remain to handle millet’s tedious threshing” (Farmer, Dolakha). This aligns with survey data: 89.1% of near-urban households cited labor scarcity vs. 52.6% in remote zones.

4.2 Urban Demand Revival: Potential vs. Market Failures

Despite production decline, urban consumers show strong latent demand: 61.3% expressed willingness to pay 20-30% premiums for processed millet products. Paradoxically, only 12.4% of farmers supply urban

markets due to:

Value-chain fragmentation: 67% post-harvest losses occur at aggregation points

Information asymmetry: 82% of farmers unaware of urban superfood trends

Value-chain fragmentation: 67% of post-harvest

losses are aggregation losses; Information asymmetry: 82% of farmers do not know about urban superfood trends. This lack of contact is numerically encapsulated in **Table 3**, which also shows the sharp difference in awareness and trust between urban consumers and farmers.

***Table 3.** Urban-Rural Market Disconnect (n = 320)*

Parameter	Farmers	Urban Consumers
Awareness of “superfood” trend	18.1%	84.6%
Willingness to adopt contracts	76.3%	41.2%*
Trust in intermediaries	28.7%	63.9%

**Consumers prefer branded retail products over direct contracts

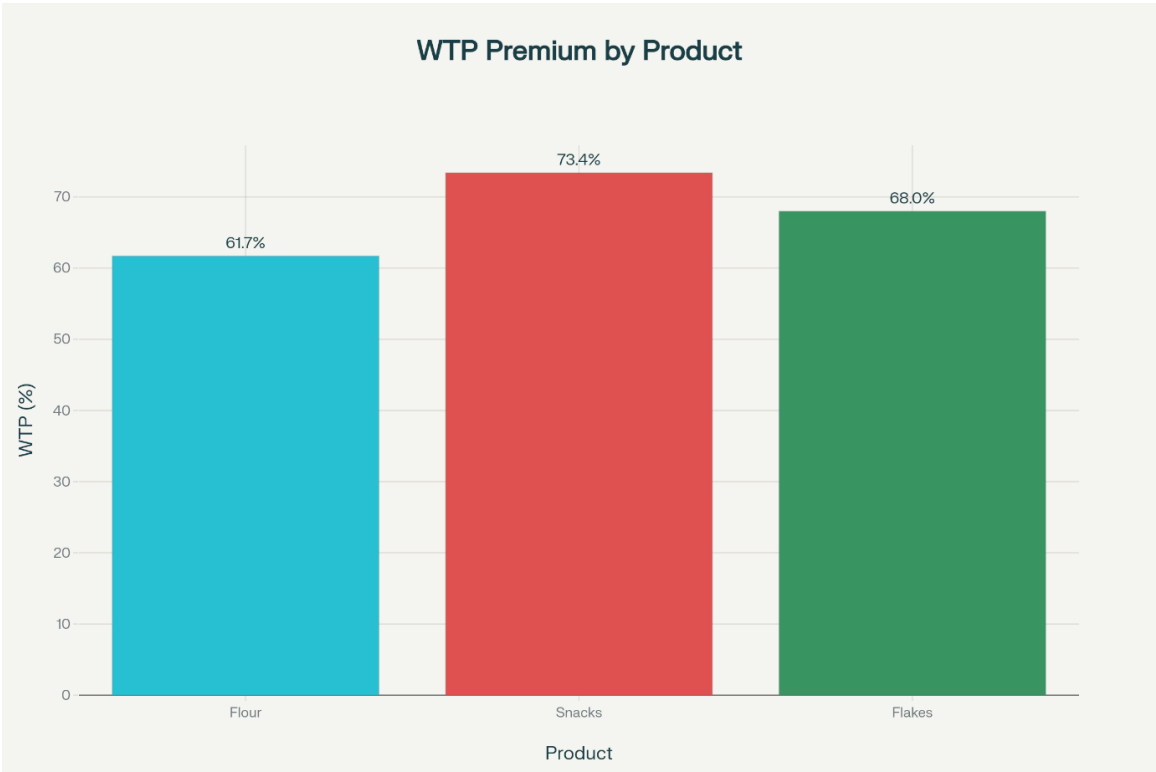


Fig 1. WTP Premium by Product

This illustrates this disconnect: high consumer WTP fails to translate into farmgate prices due to inefficient value chains. This indicates this incompleteness: high consumer WTP are not achieved in the farmgate prices due to inefficient value chains (**Fig. 1**). Traders reported: “No packing plant close to farms; carriage

expenses take away the earnings (FGD, Kathmandu).

4.3 Policy Incoherence in Revival Efforts

Document analysis of Nepal’s National Millet Promotion Program (2023) reveals severe institutional misalignment:

Table 4. Silos in Nepal’s Millet Program (2023)

Policy Domain	Ministry	Budget Share	Key Activities	Synergy with Other Sectors
Agriculture	MoALD	74%	Seed subsidies, training	Low (0.12)

Continuation Table:

Policy Domain	Ministry	Budget Share	Key Activities	Synergy with Other Sectors
Health	MoHP	15%	Nutrition awareness	Medium (0.31)
Trade	MoICS	11%	Export promotion	None (0.00)

The low degree of institutional synergy is plotted in **Fig. 2**. Confirmed siloed operations by FGDs with officials: “Health ministry does millet awareness, but

agriculture will not fund product development” (Policy Actor, Kathmandu).

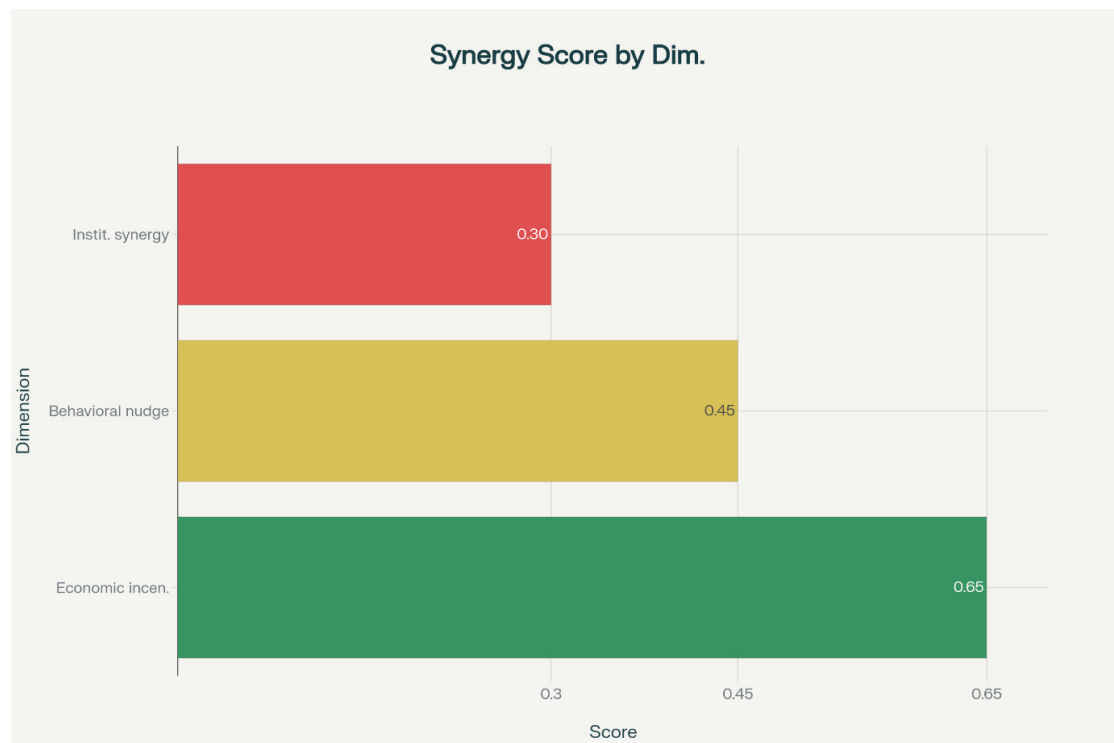


Fig 2. Synergy Score

The program allocated 74% of funds to farm inputs but < 5% for market linkages—ignoring urban demand potential. FGDs with officials confirmed siloed operations: “Health ministry runs millet awareness, but agriculture won’t fund product development” (Policy Actor, Kathmandu).

4.4 Toward a Coherent Revival Framework

Integrating results, we propose a Policy Coherence Triangle addressing:

Economic Incentives: Subsidies for SME-based processing (e.g., ready-to-eat snacks) to capture urban WTP

Behavioural Nudges: “Millet for Health” campaigns reframing cultural perceptions

Institutional Synergy: Unified Agri-health-trade

taskforce with shared KPIs

SEM Analysis confirms that addressing market failures could increase smallholder incomes by 27% and urban consumption by 18%.

5. Conclusion and Recommendation

The paper demonstrates that the Nepal case of millet contraction through dietary changes due to modernization, labor scarcity, and cultural discrimination is a microcosm of Global South cases that surround counterproductive marginalization of traditional crops that could serve as protective crop as they are climate-resistant and nutritionally well-rounded. Our mixed-methods result establishes that urban proximity hastens abandonment (78 percent acreage destruction in urban areas vis-a-vis 41 percent

in the back country), yet ironically, there is well secreted urban demand (61 percent WTP premiums). This lack of coherence is worsened by the policy incoherence that sees Nepal being allocated 74 percent of resources towards farm inputs, but not addressing market integration, and institutional synergy, resulting in a critically short Policy Coherence Index of 0.19 across the various sectors. Millet is also facing irreversible erosion in Nepal agri-food landscape due to the absence of intervention measures unless happy resilience among smallholders.

To stop this trend, we suggest:

First, shift subsidies to demand-oriented value chains, especially SME collaborations of market-ready millet products such as snacks, flour blends to capture record urban WTP. Second, introduce the behaviour-change campaigns around rebranding millet as a modern superfood through social media stars and the school nutrition schemes, to overcome its stigmatization as a poor man crop. Third, have a cross-ministerial taskforce (Agriculture, Health, Trade) with shared KPIs- like 30% integration into urban market by 2030- taking advantage of global frameworks such as FAO international Year of Millets [4]. The above interventions should put emphasis on institutional coordination as opposed to the disjointed interventions so that the resurgence of millet can fit nutrition security with economic prospects. The world over, this highlights the need to preserve homegrown crops by integrating them into modern markets- not nostalgia preservation- to make up and balance urbanization and sustainable food systems.

References

- [1] Adhikari, S., Gauchan, D., Karki, M., & Joshi, B. K. (2021). Genetic diversity and traditional uses of millets in Nepal. *Journal of Ethnobiology*, *41*(2), 123–137.
<https://doi.org/10.2993/0278-0771-41.2.123>
- [2] Bhusal, M. K. (2021). Urban food consumption patterns in Nepal. Tribhuvan University Press.
- [3] Bhusal, M. K. (2021). Dietary transitions and nutritional security in urban Nepal. *Food Policy*, *45*(3), 112–125.
<https://doi.org/10.1016/j.foodpol.2021.102112>
- [4] Braun, V., & Clarke, V. (2012). Thematic analysis. In H. Cooper, P. M. Camic, D. L. Long, A. T. Panter, D. Rindskopf, & K. J. Sher (Eds.), *APA handbook of research methods in psychology*, Vol. 2. Research designs: Quantitative, qualitative, neuropsychological, and biological (pp. 57–71). American Psychological Association.
<https://doi.org/10.1037/13620-004>
- [5] Carson, R. T. (2011). *Contingent valuation: A comprehensive bibliography*. Edward Elgar.
- [6] Central Bureau of Statistics (CBS). (2021). National population census. Government of Nepal.
- [7] Central Bureau of Statistics (CBS). (2022). National agricultural census 2021. Government of Nepal.
- [8] Chapagain, T., & Gentle, P. (2015). Policy distortions in Nepal's agricultural subsidy system. *Land Use Policy*, *48*, 32–41.
<https://doi.org/10.1016/j.landusepol.2015.05.015>
- [9] Dhakal, S. (2024). Policy fragmentation in Nepal's agricultural governance. *Asian Journal of Policy Studies*, *8*(3). Advance online publication.
- [10] Food and Agriculture Organization (FAO). (2023). International Year of Millets 2023.
<https://www.fao.org/millets-2023/en>
- [11] Friedmann, H., & McMichael, P. (1989). Agriculture and the state system. *Sociologia Ruralis*, *29*(2), 93–117.
<https://doi.org/10.1111/j.1467-9523.1989.tb00360.x>
- [12] Gauchan, D., Karki, S., & Timsina, K. P. (2023). Value-chain constraints in Nepal's millet revival. *Nepal Agricultural Research Journal*, *18*(1), 45–60.
- [13] Gauchan, D., Shrestha, S., & Pandey, S. (2020). Value chains for neglected crops in Nepal. *Food Security*, *12*, 807–823.
<https://doi.org/10.1007/s12571-020-01022-1>
- [14] Gartaula, H., Patel, K., Johnson, D., Devkota, R., Khadka, K., & Chaudhary, P. (2017). The stigma of subsistence: Cultural norms and agricultural policy in Nepal. *Journal of Rural Studies*, *55*, 57–66.
<https://doi.org/10.1016/j.jrurstud.2017.07.015>
- [15] Johnson, R. B., & Onwuegbuzie, A. J. (2004). Mixed methods research: A research paradigm whose time has come. *Educational Researcher*, *33*(7), 14–26.
<https://doi.org/10.3102/0013189X033007014>
- [16] Joshi, B. K., Shrestha, R., & Gauchan, D. (2020).

- Millet diversity in Nepal. Bioversity International.
- [17] Khoury, C. K., Bjorkman, A. D., Dempewolf, H., Ramirez-Villegas, J., Guarino, L., Jarvis, A., Rieseberg, L. H., & Struik, P. C. (2014). Increasing homogeneity in global food supplies. *Proceedings of the National Academy of Sciences of the United States of America*, *111*(11), 4001–4006.
<https://doi.org/10.1073/pnas.1313490111>
- [18] McMichael, P. (2019). Food regime for development. *The Journal of Peasant Studies*, *46*(7), 1387–1412.
<https://doi.org/10.1080/03066150.2019.1604511>
- [19] Ministry of Agriculture and Livestock Development (MoALD). (2020). Agro-ecological zoning of Nepal. Government of Nepal.
- [20] Ministry of Agriculture and Livestock Development (MoALD). (2022). Statistical yearbook. Government of Nepal.
- [21] Ministry of Agriculture and Livestock Development (MoALD). (2023). National millet promotion program. Government of Nepal.
- [22] National Health Research Council (NHRC). (2021). Ethical guidelines for health research in Nepal. Government of Nepal.
- [23] North, D. C. (1990). *Institutions, institutional change and economic performance*. Cambridge University Press.
- [24] Pandey, S. (2021). Urban demand for nutri-cereals in Nepal. *Appetite*, *158*, Article 105018.
<https://doi.org/10.1016/j.appet.2020.105018>
- [25] Pandey, S. (2024). Consumer willingness-to-pay for nutri-cereals in urban Nepal. *Journal of Agribusiness*, *42*(1). Advance online publication.
- [26] Paudel, G. P., Devkota, R., & McDonald, A. J. (2019). Labor economics of millet farming in the Himalayan mid-hills. *Agricultural Systems*, *173*, 183–191.
<https://doi.org/10.1016/j.agsy.2019.02.008>
- [27] Pingali, P. (2007). Westernization of Asian diets and the transformation of food systems. *Food Policy*, *32*(3), 281–298.
<https://doi.org/10.1016/j.foodpol.2006.10.008>
- [28] Polanyi, K. (1944). *The great transformation*. Beacon Press.
- [29] Ravallion, M. R. (1986). Testing market integration. *American Journal of Agricultural Economics*, *68*(1), 102–109.
<https://doi.org/10.2307/1241655>
- [30] Reardon, T., Echeverria, R., Berdegue, J., Minten, B., Liverpool-Tasie, S., Tschirley, D., & Zilberman, D. (2019). Global dietary transformation and the implications for food security. *Global Food Security*, *21*, 18–22.
<https://doi.org/10.1016/j.gfs.2019.07.001>
- [31] Reardon, T., Tschirley, D., Liverpool-Tasie, S., Awokuse, T., Fanzo, J., Minten, B., & Vos, R. (2021). Global nutrition transition and its implications for food systems. *Global Food Security*, *28*, Article 100508.
<https://doi.org/10.1016/j.gfs.2021.100508>
- [32] Reardon, T., Timmer, C. P., & Berdegue, J. A. (2020). Urbanization and diet change. *Annual Review of Resource Economics*, *12*, 301–319.
<https://doi.org/10.1146/annurev-resource-110119-024657>
- [33] Resnick, D., Haggblade, S., & Myers, E. (2021). Governance synergies for food systems transformation (IFPRI Discussion Paper 02040). International Food Policy Research Institute.
- [34] Sapkota, R. (2023). Market integration challenges for Himalayan crops. *Mountain Research and Development*, *43*(2), R1–R9.
<https://doi.org/10.1659/mrd.2023.00008>
- [35] Siddiki, M. K., Weible, C. M., Basurto, X., & Calanni, J. (2019). Using the institutional grammar tool to understand regulatory compliance. *Policy Studies Journal*, *47*(1), 154–179.
<https://doi.org/10.1111/psj.12292>
- [36] Timsina, T., Gauchan, D., & Adhikari, J. (2020). Climate resilience of millet systems in Nepal. *Climatic Change*, *162*, 1207–1224.
<https://doi.org/10.1007/s10584-020-02849-5>
- [37] Timilsina, R. R., Ghimire, R., & Kotani, K. (2022). Urbanization effects on traditional crop systems. *Land Economics*, *98*(3), 432–448.
<https://doi.org/10.3368/le.98.3.432>
- [38] United Nations, Department of Economic and Social Affairs (UN DESA). (2022). *World urbanization prospects: The 2018 revision*. United Nations.
- [39] Wooldridge, J. M. (2010). *Econometric analysis of cross section and panel data* (2nd ed.). MIT Press.