Household Demand for Fish and Alternative Protein Sources in Nepal: A QUAIDS-Based Analysis

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INTRODUCTION

- Fish contributes ~20% to the national animal protein intake in Nepal, and is a key source of micronutrients and omega-3 fatty acids (Shrestha et al., 2022).
- The Government of Nepal is prioritizing the fisheries sub-sector to promote the blue economy, create jobs, and enhance nutrition security, recognizing its rapid growth rate among agricultural sub-sectors (Gautam & Sapkota 2024; MoALD, 2022).
- Nepali fish markets are primarily dominated by premium-range species (e.g., Rainbow Trout, Catla, Rohu, Snow Trout, Eels, and Golden Mahseer) and budget-range options including Silver Carp, Mrigal, Catfish, Puntia, Garra, and Rewa.
- Between 1996-2023, overall Nepalese household spending rose by 176% (NSO, 2024), accompanied by increased intake of animal-source protein, reflecting a shift in consumer preferences towards more diverse protein sources.
- However, empirical research on household demand for fish and other key protein sources along with associated elasticities of demand is limited, creating a significant knowledge gap for designing nutrition-focused and inclusive fishery policies.

RESEARCH QUESTIONS

- To what extent are households responsive to change in income, and prices of fish and its close protein substitutes?
- What patterns of substitution exist across socioeconomic and demographic factors?

DATA

- ***Data source:*** Cross-sectional microdata from The Fourth Nepal Living Standards Survey (NLSS-IV) conducted in 2022/23 (NSO, 2024).
- ***Sample selection:*** Out of 9,600 surveyed households, we considered 1,027 fish consumers across 319 primary sampling units (PSUs) in 36 districts, covering four provinces: Bagmati, Madhesh, Lumbini, and Gandaki (Figure 1).

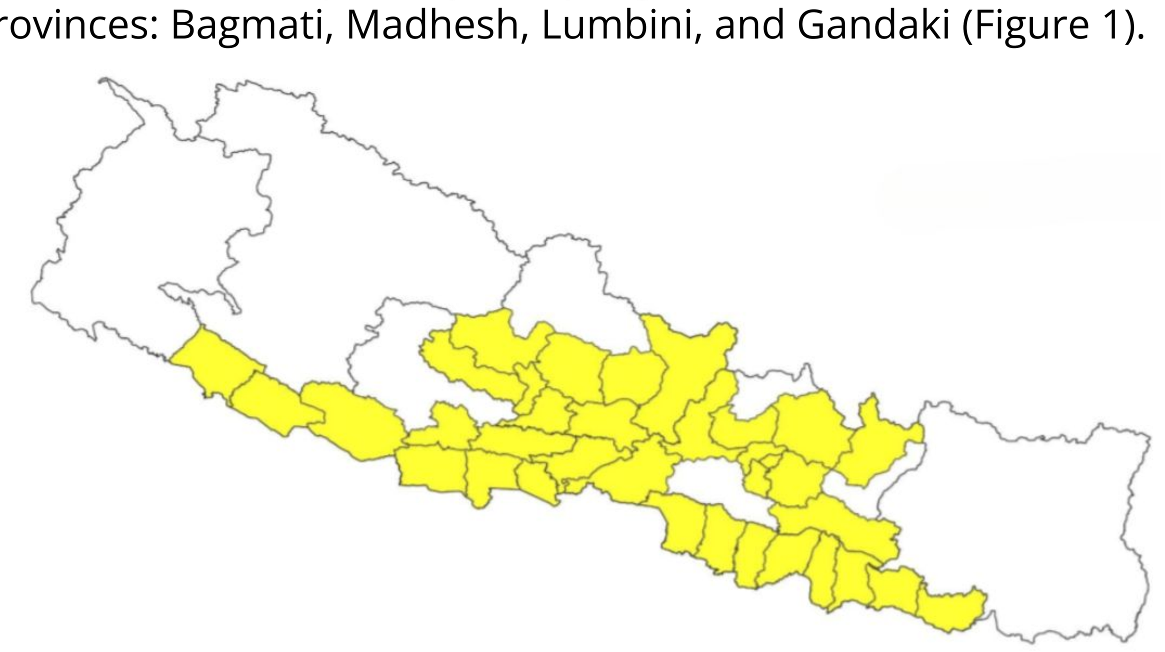

Fig 1. Map of Nepal highlighting 36 study districts in four provinces

- ***Variables***:
  - *Fish products type:*
    - ❖ Premium range (>NPR 400/kg): Rainbow Trout, Catla, Rohu, Seafood Products, and indigenous species (Snow Trout, Eel, Golden Mahseer)
    - ❖ Budget range (≤NPR 300/kg): Silver Carp, Mrigal, Catfish, and some indigenous species (Puntia, Garra, Molee)
  - *Protein substitutes:* Chicken, egg, buff, mutton and chevon, pork, milk and dairy, and pulses.
  - *Household characteristics:* Age of household head, household size (*normal vs large*), literacy level (*literate vs illiterate*), market proximity (*close vs far*), poverty level (*ultra-poor vs non-poor*), residence (*rural vs urban*).

EMPIRICAL MODEL

- Household demand elasticities for fish and protein substitutes were estimated using the QUAIDS model (Banks et al., 1997; Poi, 2012).

$$w_i = \alpha_i + \sum_{j=1}^{n}\gamma_{ij}\ln p_j + \beta_i \ln\left(\frac{E}{a(\mathbf{p})}\right) + \frac{\lambda_i}{b(\mathbf{p})}\left[\ln\left(\frac{E}{a(\mathbf{p})}\right)\right]^2 + \sum_k \delta_{ik} z_k$$

where, ω_i = budget share of protein source *i*;
α_i, γ_{ij}, β_i, λ_i, and δ_{ik} are parameters to be estimated;
p_j = price of protein source (e.g., price of fish, chicken, and alike);
*a(**p**) and b(**p**) are price index functions*; *E* = total food expenditure;
z_k = household characteristics or demographic shifters.

- Expenditure (income) elasticities were estimated as:

$$\eta_i = 1 + \frac{1}{w_i}\left(\beta_i + \frac{2\lambda_i}{b(\mathbf{p})}\ln\left(\frac{E}{a(\mathbf{p})}\right)\right)$$

- Similarly, uncompensated (Marshallian) price elasticities were estimated as:

$$\varepsilon_{ij} = \frac{1}{w_i}\left[\gamma_{ij} - \left(\beta_i + \frac{2\lambda_i}{b(\mathbf{p})}\ln\left(\frac{E}{a(\mathbf{p})}\right)\right)\left(\alpha_j + \sum_k \gamma_{jk}\ln p_k\right) - \frac{\lambda_i\beta_j}{b(\mathbf{p})}\left(\ln\left(\frac{E}{a(\mathbf{p})}\right)\right)^2\right] - \delta_{ij}$$

RESULTS

I. Food budget and consumption pattern

- Households spent ~37% of food budget on fish and other protein-rich foods.
- Expenditure on protein-rich foods included fish (34%—comprising 20% budget options, 14% premium), chicken (21%), milk and dairy products (18%), mutton (12%), pulses (7%), egg (4%), buff (2%), and pork (2%).
- Among the 9600 households in NLSS-IV, 15.4% consumed fish with an average consumption frequency of 1.5 days per week.
- While per capita national fish consumption is only 2.43 kg, it averaged ~14 kg (budget options: 14.7 kg; premium: 13.5 kg) in fish-consuming households.

II. Expenditure/income responsiveness

- *Fish:* Budget species are more responsive to prices than the premium options. Premium species were luxury for the ultra-poor (η = 2.61) but a necessity for the non-poor (η = 0.26).
- *Pulses and milk*: Highly income elastic in urban areas and for normal household size, reflecting changing preferences with rising income.
- *Chicken and eggs*: Moderately elastic making them reliable targets for promoting nutrition security.
- Buff, pork, and mutton had near unitary elasticity, indicating stable and consistent response to prices.

Table 1. Estimates of expenditure elasticities

Protein groups	Overall	*Household size*		*Poverty level*		*Residence*	
		Normal (≤5)	Large (>6)	Ultra-poor	Non-poor	Urban	Rural
Premium Fish	0.25*	0.14	0.75	2.61	0.26	0.75	0.82
Budget Fish	2.29	1.75	1.62	3.70	1.42	2.44	1.85
Chicken	1.18	1.18	1.12	0.95	1.21	1.22	1.13
Egg	1.08	1.09	0.98	0.96	1.10	0.98	1.20
Buff	0.98	0.97	0.97	0.98	1.01	0.96	1.04
Mutton	0.97	0.98	0.94	1.03	1.01	0.99	0.97
Pork	0.98	0.96	0.99	0.97	1.00	0.97	1.03
Pulses	2.42	2.66	1.86	1.30	1.15	2.87	1.62
Milk	1.33	1.26	1.28	0.98	1.43	1.25	1.41

*Notes: All values are statistically significant at 1% level except those denoted by * (5% significance level).*

III. Uncompensated (Marshallian) own-price elasticities

- Price elasticities ranged from -4.51 to +3.06, indicating heterogeneous demand responses for fish and alternative sources of proteins in Nepal.
- Ultra-poor households were highly sensitive to fish prices, and likely to abandon fish 7× faster than non-poor households when when prices rise.
- Consumers were moderately price sensitive to chicken, egg, buff, mutton, pork (η between –0.6 and –0.85);
- Demand for pulses was mixed while milk consumption was modestly elastic (η = –0.6 to –0.83) with ultra-poor more sensitive to prices.

Table 2. Estimates of uncompensated own-price elasticity of demand

Protein groups	Overall	*Household size*		*Poverty level*		*Residence*	
		Normal (≤5)	Large (>6)	Ultra-poor	Non-poor	Urban	Rural
Premium Fish	-0.61	-0.49	-0.43	-3.59	-0.48	-0.53	-0.63
Budget Fish	-0.58	-0.72	-1.68	-4.51	-0.59	-0.59	-0.60
Chicken	-0.84	-0.83	-0.85	-0.85	-0.65	-0.84	-0.85
Egg	-0.81	-0.81	-0.81	-0.83	-0.75	-0.84	-0.77
Buff	-0.78	-0.78	-0.78	-0.57	-0.67	-0.80	-0.04
Mutton	-0.86	-0.86	-0.86	-0.81	-0.98	-0.86	-0.07
Pork	-0.77	-0.77	-0.77	-0.77	-0.66	-0.77	-0.75
Pulses	0.89	1.24	0.02^{ns}	-0.61	-0.27	3.06	-0.43
Milk	-0.77	-0.77	-0.76	-0.83	-0.63	-0.75	-0.78

Notes: All values are statistically significant at 1% level except that denoted by ns (not significant).

IV. Cross-price elasticities

- Cross-price elasticities of demand for protein sources ranged from near-zero substitution (η = -0.003) to high substitutability (η = 2.4).
- Notably, positive cross-price elasticity of demand between premium and budget fish options indicated considerable degree of substitutability.
- Chicken and mutton were strong substitutes for premium fish, while budget options and eggs were weaker substitutes.

CONCLUSIONS AND IMPLICATIONS

- Fish consumption is rising in Nepal, but per capita intake remains low, with poor and large households showing strong income-driven demand for budget fish options, milk and dairy products, and pulses.
- High price sensitivity among the poorest—up to 7 times that of the non-poor—signals a need for targeted price stabilization and demand forecasting.
- Flexible substitution among protein sources, along with urban–rural demand contrasts, highlight the need for diversified, location-specific strategies for promoting protein intake.
- Further analysis is warranted, possibly using two-stage regression approach, to address potential selection bias between fish consumers and non-consumers.

SELECTED REFERENCES

Banks, J., Blundell, R., & Lewbel, A. (1997). Quadratic Engel curves and consumer demand. *Review of Economics and Statistics*, 79(4), 527-539.

NSO. (2024). Nepal Living Standards Survey IV 2022-23. National Statistics Office. Office of the Prime Minister and Council of Ministers, Kathmandu, Nepal.

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