

## Dasu Hydropower Project, Pakistan: Changing Food Habits, Dietary Composition and Food Value Chain among the Affected Population

Bakht Muhammad Khan <sup>1</sup>, Anura Widana <sup>2</sup> and Sadia Batool <sup>3</sup>

<sup>1</sup> Gender and Public Health Specialist, Dasu Hydropower Project

<sup>2</sup> Team Leader, Management Support Consultant, Dasu Hydropower Project

<sup>3</sup> Gender Advisor, Management Support Consultant, Dasu Hydropower Project

DOI: <https://doi.org/10.56293/IJMSSSR.2025.5401>

IJMSSSR 2025

VOLUME 7

ISSUE 1 JANUARY – FEBRUARY

ISSN: 2582 - 0265

**Abstract:** Background This pioneering study examined the dynamics of food habits and consumption patterns among people affected by construction of the Dasu Hydropower Project in Upper Kohistan District, Pakistan. Project implementation began in 2016 and completion is planned for 2028. As of 2024 about 3,000 households from 47 of 520 villages in the district have been relocated, and the local economy has changed dramatically.

Methods Three food-related surveys were conducted: (i) in 2022, interviews with male adults from 42 households, (ii) in 2023, a detailed survey of 400 affected households, and (iii) in 2024, in-depth interviews with 55 women. All respondents were drawn from relocated households. Quantitative data were analysed using statistical tools and qualitative information was analysed thematically.

Results The study found that the majority of affected households (61%) have at least one member in paid employment, a significant contrast with the pre-project period when only 27% of households did so. Consequently, purchasing power has significantly increased. In parallel, working and living together with the in-migrant project workforce has changed residents' attitudes and behaviour regarding food. Local agricultural production has decreased, food purchase has increased, meat, eggs and milk are consumed more frequently, there are more restaurants with a wider and better variety of food, eating-out has increased, and the market is now stocked daily with a much wider and fresher variety of food products than was available before the project started. Food consumption remains highly gendered, but there are signs of a trend towards more equality.

Conclusions This study analysed the food habits, dietary intake and consumption patterns of households directly affected by the Dasu Hydropower Project. It found that the consumption of basic staples and high-value food items significantly improved from 2015 to 2024. In parallel, men from affected households eat-out frequently now. The sector has responded to the new demand with more food outlets, a wider cuisine and an improved supply of fresh produce to the market. The changes in food consumption and eating habits have been enabled by increased household incomes and assisted by attitudinal change resulting from close work-association with the outside workforce. The changed food habits, dietary composition, eating-out behaviour and food value chains all indicate a higher standard of living amongst the surveyed population. The conclusion of the study is that dietary transition in the affected households has occurred and is the result of growth in household incomes and behavioural change. On this note, it can be argued that some affected people's lifestyles have improved as a result of the hydropower project.

The study recommends gender-sensitive promotion of horticulture and livestock husbandry, a continuation of food-related monitoring, and applied research with a focus on the food status of the most vulnerable households, women and children.

**Keywords:** Dasu Hydropower project; food and nutrition; dietary composition; dining pattern; food value chain; poverty

## 1. Introduction

Disparities in food habits are defined as the differences in food consumption among adult men and women based on education and/or occupation (Roos and Ritva Prattala, 1999). With the advent of urbanization and industrialization, such disparities are common across many countries. Implementation of the Dasu Hydropower Project (DHP) in Upper Kohistan District has brought many changes including a rise in the living standards of the affected population. This paper examines the type and nature of food intake and dietary disparities resulting from the DHP.

The literature review produced below provides background on food consumption, nutrition, health, income and development. Food is a key ingredient in personal health (Hu FB, 2002). A basket comprising a variety of food items providing balanced and continuous nutrition is necessary to sustain the physical and mental health of the population. The health and nutrition of its inhabitants are important contributory factors towards human resource development of any country, so much so that 193 countries which met in 2015 under the umbrella of the United Nations agreed for zero hunger as goal number two and good health and well-being as goal number three of 17 Sustainable Development Goals for all nations (United Nations, 2015). Both goals primarily relate to food consumption. The UN declaration confirms that a balanced diet is an important indicator of sustained development. A good nutrient supply is vital for brain development in children and adolescents. Without good nutrition, the human body is more prone to diseases, infections, fatigue and overall poor performance. A balanced diet, together with exercise, is an essential ingredient for reducing diseases and thereby reducing spending on curative medicine.

Over decades, food consumption patterns in many countries have changed significantly (Roos and Prattala, 1999; Bandara, et al., 2021). Halder and Urey (2003) have shown that with an increase in income, people tend to spend more on higher value products such as meat, fruits, vegetables and sweets. Dolislager (2017) identified three ways by which household food consumption patterns change in response to a rise in income. First, more food is purchased rather than home-grown, second, more is spent on perishable items, and finally more processed food is consumed.

The UN Food and Agricultural Organization has defined dietary diversity as a qualitative measure of food consumption that reflects a household's access to a basket of food (FAO, 2011). Dietary diversity is also considered a proxy for nutrient diversity. Dietary transition, also known as nutritional transition, is characterized by a shift from traditional fibre and grain-rich diets to fat and sugar-rich diets (Drewnowski, 1997), and has taken place in a number of countries due to factors such as urbanization, income growth, improved communication, education, etc. (Drewnowski, 1997; Bandara, 2021; Roos, 1999).

Comparing consumption patterns in several countries, Gerbens-Leenes and Nonhebel (2010) found that consumption represents more than two-thirds of Gross Domestic Product (GDP), suggesting that an increase in food consumption is a strong indicator of development. Food habits and consumption patterns vary globally as a result of different demographic and socioeconomic factors such as education, income level, household size, family structure, etc. (Kearney, 2010). Wadkar et al., (2017) identified similar factors influencing the dietary pattern and nutritional status of households, such as household income, expenditure, family size and educational status, and proposed that improved nutritional status could be achieved by influencing these factors and providing improved agricultural technology to farmers. Afshin et al., (2014) confirmed the role of income and education in dietary transition, and identified other factors such as food prices, sociocultural and religious preferences, local and regional agricultural production, domestic and international food transportation networks, and marketing and retailing as other contributory factors. In Bangladesh, Kabir et. al (2018) confirmed that eating behaviour and dietary intake is influenced by, among others, societal factors, of which association with peers is particularly significant. Food habits are changing worldwide, in countries at all stages of development. Through an extensive data analysis Clements et al (2006) confirmed that income is a main determinant of food consumption patterns, and that the main difference in food consumption between developed and developing countries is food income elasticity. In developed nations the elasticity is low whilst in developing nations it is near one, suggesting that income changes in developing countries will result in major changes in food consumption, unlike their developed

counterparts. Working on a similar theme, Banerjee and Duflo (2007) established that an increase in household income creates a greater demand for food. By the same token, affluent households spend proportionately less on food as income grows. Chai (2018) confirmed that low-income households dedicate most of their income to satisfy basic needs, of which food takes the lion's share. The effects of income on food demand tend to be stronger among lower income households (Houthakker, 1957). Food income elasticities can also differ by food group, with staple foods having low or even negative income elasticities and high-value food products having higher elasticities, though results are often context-specific (Deaton, 1997; Strauss and Thomas, 1995). Finally, eating habits are now far less rigid than they were 20 years ago (O'Shaughnessy, 2017). The advent of paid work, busy lifestyles and other activities have forced people move away from rigid dining patterns. People tend to fit eating-out habits into their lives by resorting to eat what they like when they want to, mixing and matching rather than conforming to traditional values.

## METHODOLOGY

### Study purpose

This study examines changes in food habits and consumption by project-affected households between the pre-project period (2015) and the present day (2024). It was carried out within the footprint of the Dasu Hydropower Project, which to date has displaced and resettled over 3,000 households. The study has four purposes: (i) to compare the current (2024) composition of the affected households' diet and food habits with those of 2015, (ii) to evaluate food supply sources and value chains between 2015 and 2024 and their effects on food habits, (iii) to assess whether there have been any changes in the eating-out habits of the affected people, and (iv) to identify causal factors possibly associated with the project. The paper concludes with some suggestions to further improve the food and dietary habits of the affected population.

### Methods

The study sourced data from three independent surveys carried out in the project zone from 2022 to 2024. All three studies engaged respondents from the affected population of about 3,000 households. First, in 2022 a survey of 42 men was conducted to understand their food consumption and behaviour since the beginning of the project in 2015. Second, in 2023 food and nutrition data were gathered from a larger sample of 400 households. Finally, women being the main actors involved in food preparation and serving, in 2024 in-depth interviews were held with 55 women from affected households. Different questionnaires were used for each survey, with respondents' memories being relied on for information on the pre-project period. The respondents for the first survey were any adult member of the household in paid employment. The respondents for the second survey in 2023 came from a stratified random sample of 3,000 project-affected households. The third survey in 2024 was based on a sub-sample of 55 households and focused only on women. Responses for the first and last surveys were recorded on hard-copy questionnaires and the data subsequently analysed in Excel. The larger second survey used tablets in the field, data being held in the cloud.

The 2024 survey was the first known attempt to conduct interviews directly with Kohistani women. Local customs prevent women from employment, from appearing in public life or from meeting other women from outside their community, let alone from other districts. For these reasons, two local women who were well trained in survey techniques were engaged to conduct the interviews. The survey was conducted with the approval of both the respondents' husbands and community elders, who have a considerable influence on who local women are allowed to interact.

The majority of survey participants expressed happiness at being interviewed as no agency had ever collected information about what they eat and composition of their diet. A few wished to know whether there would be any benefits made available to them after the survey.

### The study area

Kohistan Region is part of the Khyber Pakhtunkhwa Province (KPP) of Pakistan. In 1976 the Region was divided into three districts: Upper Kohistan, Lower Kohistan and Kolai-Palas. Dasu Hydropower Project in Upper Kohistan District is one of the largest development activities currently being undertaken in the country. The main dam across the Indus River is located some 8 km upstream of Dasu Town (Figure 1).

Construction of the project started in 2016. The project footprint covers 47 of 520 villages in the district, and necessitates the relocation of some 3,000 households. The program of physical resettlement began in 2016 and was nearly finished in 2024. It is expected that the project will be completed in 2028. All of the affected households will have been relocated in the next 1-2 years.

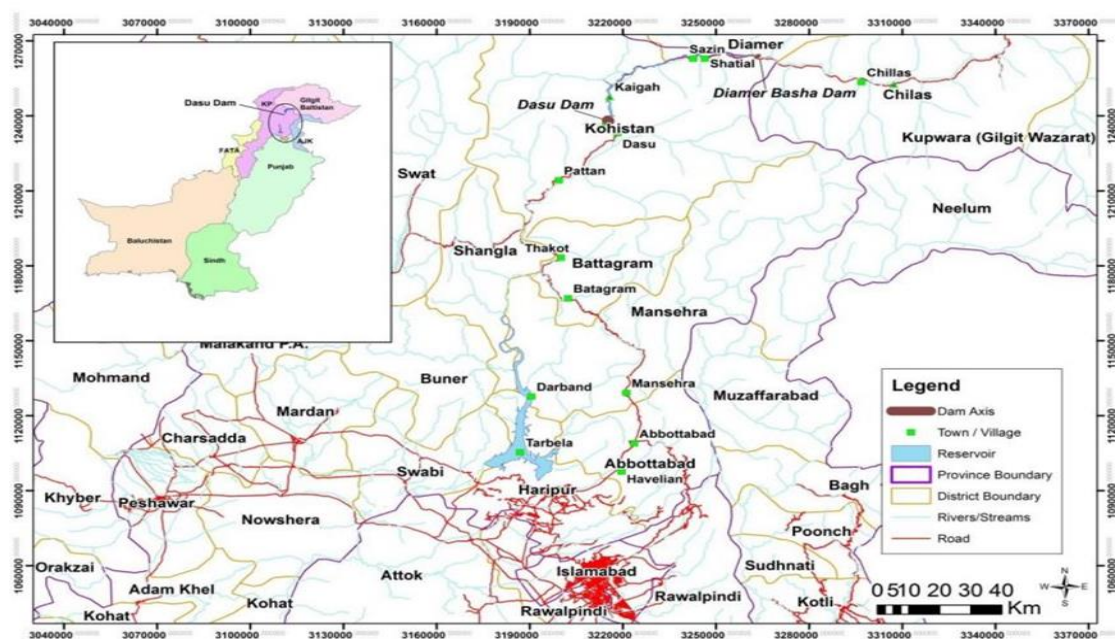


Figure 1: Location of DHP

Being a remote part of the country with very strong traditional customs, no reliable road network and minimal connectivity, there is little information about Kohistani people's food sources, dietary habits and nutritional status. The low living standard of the population, poor education and low literacy rate are associated with a diet in general considered low quality, rich in carbohydrates but low in protein and other vital nutrients. Other factors contributing to the impoverished food consumption pattern are low incomes, market inaccessibility and an agricultural sector marked by low productivity and an absence of improved techniques and high-yielding plant material.

A poor diet and nutritional inadequacies have led to health impacts on the resident population. According to a recent study, many children in the district are severely malnourished whilst pregnant women do not receive a balanced diet, leading to birth disorders and compromised health amongst newborns (CERD, 2023). The same study reported a 40% severe stunting rate<sup>1</sup> among children below five years of age and also that 8% of children are severely malnourished, a result of constrained access to the quantity and quality of food items needed for adequate nutrition. This, in turn, was attributed to a combination of poverty and lack of knowledge on how to maximise nutritional benefits from available resources.

The traditional food consumed by Kohistani people consists of maize or wheat bread, *saag* (local vegetables such as okra, leafy vegetables, broad beans), *lassi* (yoghurt mixed with water) and butter. Eggs are eaten mainly at

<sup>1</sup> Severe stunting is a condition where a child's height is more than three standard deviations below the median of the World Health Organization's (WHO) Child Growth Standards for their age and sex.

breakfast whilst meat is eaten only occasionally. Although a few people catch fish in streams and the river, this is mainly for home consumption and is not a major source of protein for the wider population. Vegetables and the two staples, maize and wheat, are partly locally-grown but mostly imported from other parts of the country.. A large proportion of the dairy-based items such as milk, ghee and butter are produced locally. The consumption of dairy items increases between May and September during the seasonal migration of the population and their livestock to alpine summer pastures. Other items such as sugar, spices, rice and cooking oil are bought in the local market.

Almost all household members eat three meals a day, a light breakfast (between 6 to 7 am), a substantial mid-day lunch, and dinner (between 7 to 9 pm). Three meals a day is a tradition in Kohistan as well as in the country in general, and has not changed from the pre-project period. Breakfast consists of a starch-based item such as locally made bread, tea with milk and an egg whilst lunch and dinner normally comprise of items such as bread or rice eaten together with ghee, saag, lassi and, on special occasions, meat. Dinner typically comprises bread, some saag and the lunch left-overs from lunch.

## RESULTS AND DISCUSSION

As far back as the project's design phase it was realised that resettlement activities and the associated loss of agricultural land might result in food being less available to some households, whilst at the same time the financial benefits from cash compensation for relocated families and construction-related jobs might counterweigh the negative impacts. This thinking was reflected in the project's Public Health Plan which proposed a "capacity building package" that included food and nutrition development (Nippon Koei, 2012).

As of 2023, about 75% of affected households had moved from their traditional land and 37% had been fully relocated (MSC, 2023). People who not yet permanently relocated were in transition stage, living in rented houses or with their friends and relatives. A majority of the households in resettlement process had received compensation for loss of land and other assets.

The surveys' main findings are described below with notes on social features as context.

### Socioeconomic Features

*Households:* All survey respondents are residents of the Dasu Valley. On average, each household consists of four families sharing a single roof, a reflection of the extended family structure of Kohistani people. All families living in one house form one household. Household size is large, with a reported average in the surveys of 8.5 persons (the average reported for the 6<sup>th</sup> Census for Kohistan Region was 7.4 persons). The 2024 survey found that household size in the central area of the valley (Komila, where services such as health and education are better) is just over 25 members compared to about 12 in other villages. This is explained as a temporary feature – in Komila many displaced families are sharing the same house before moving into permanent accommodation. It is expected that household size in this area will drop as families move to their final locations.

*Employment:* Out of about 7,000 workers in project employment, 46% are drawn from the local labour force. In terms of local people's employment, 39 % of households have at least one member in project employment and 61% of households have at least one person collecting a monthly salary (MSC, 2023). This is a significant improvement from the pre-project period in 2012 when only 27% of households had at least one person in paid employment. Another significant change is in the number of local people who consider themselves to be skilled workers: in 2023, 52% of households in the project area had skilled workers whereas outside the project area it was only 39%.

*Compensation and resettlement allowances:* The project has provided a generous compensation package to local land-owners for their immovable assets. The compensation rates for different land use types are one of the highest in the country, especially when considering that most agricultural land does not have significant real economic value, being mainly rocky, on steep slopes and degraded by erosion. The compensation package includes a cash payout

of PKR 3.5 million (\$13,462 at exchange rate of 1\$ = PKR 250) for each affected household. The average one-time cash compensation payment to each household, with resettlement allowances, has worked out at PKR 5.4 million (\$20,769).

*Household income:* The compensation and allowances provided by DHP, enhanced local employment and other business opportunities have resulted in an increase in household incomes. Income levels in 2023 are estimated to be double those of the pre-project period in real terms (MSC, 2023). The rise in disposable income has elevated food demand and consumption, both in terms of quantity and variety of food purchased. This accords with the general theory of high elasticity of food in response to a rise in the income of poor families (Banerjee, 2007; Deaton, 1997; Strauss and Thomas, 1995).

*Literacy:* According to the 2017 Census of Population and Housing, the overall literacy rate for KPK Province was 54%, with significant gender differentiation: men 69.2% and women 38.7%. The same census registered a literacy rate of 61.5% for the Greater Kohistan Region<sup>2</sup> (men 32.5% and women 8.7%). The literacy rate among men Upper Kohistan in 2023 has been estimated as 59% whilst for women it has been 5% (MSC, 2023). These figures indicate an increase of 12% for men and 5% for women between 2012 and 2023 in the project area, an improvement attributable to social programs implemented by the project. Interaction between resident Kohistanis and the non-local workforce has also contributed to this change - local residents have increasingly started to use the national language since the start of the project, paving the way for literacy transformation.

*School enrolment:* Enrolment rates in primary school have increased and now stand at about 83% for boys and 35% for girls. Among resettled households the rates are much higher, 100% for boys and 98% for girls. This is because of their relocation to urban areas and increased income, enabling easy enrolment of children in schools and the purchase of school materials. The enrolment of children, both boys and girls, is becoming a communally accepted process, a very significant change closely associated with the project.

## FOOD AND NUTRITION: MAIN FINDINGS

### Change in food consumption

The socioeconomic uplift of the affected population, as described in the previous section, has been accompanied by a rise in consumption levels, especially of food (both quantity and quality), as well as by a change in eating-out habits.

The findings of all three surveys confirm the overall improvement in food consumption between 2015 (pre-project) and now (2024). Specifically, 76% of women and 100% of men assert an improvement in food consumption patterns over this period. Reasons given include compensation and resettlement allowances, increased employment income and enhanced business activity, all contributing to an increase in purchasing power leading to a rise in household food consumption – both the variety and frequency of food consumed and the quantity of grain, meat and eggs per meal. It is to be noted that the improvements in food consumption have not been not gender-neutral, as revealed by interviews with women. These changes are discussed below.

### Composition of diet

The basic composition of local diets is a starch base such as bread, vegetables and protein such as eggs, dairy items and meat. Although the make-up of the diet itself did not change between 2015 and 2024, food sources did, from mostly home-grown to more market purchases. Details are shown in the table below. This is in accordance with Dolislager's findings (2017) where it is reported that dietary change is associated with more purchased food as lifestyles improve.

---

<sup>2</sup> Comprising of the present three districts of Upper Kohistan, Lower Kohistan and Kote-Palas all of which were previously under one Region

Table 1: Composition of Affected People’s Diet, Pre-Project and Present Day

Year	Bread	Vegetable	Dairy item	Eggs	Meat
2015	Maize-based	Locally grown	Lassi, Ghee	Local	Home-grown chicken
2022	Maize and more wheat-based	Locally grown + market	Lassi, Ghee (local) + purchased milk	Local + market	Purchased chicken + beef

All survey respondents said that the quantity of food consumed has increased, both the amount at each meal and the number of times food items such as meat and eggs are consumed. Although the surveys did not obtain data on the absolute amounts of food eaten, this aspect could usefully be built into future research on this topic.

### Frequency of food consumption

Consumption of three important food items, meat, eggs and milk, was examined in all three surveys, and four main changes were observed.

- First, according to the men surveyed, the weekly frequency of meat consumption increased from 63% to 80% between 2015 and 2022. None of the male respondents were unable to afford meat in their diets whilst 7% women said that they could afford to eat meat at present. The changes in frequency of meat consumption by men for the reference period are shown in Figure 2.
- Second, consumption of milk by households declined from 79% to 61% of those who reported daily consumption of this item. In parallel, households which did not consume milk increased from 8% in 2015 to as much as 22% in 2024. For women, 29% said that at present they do not consume milk in an average week.
- Third, all women interviewed reported a lower frequency of meat consumption compared to men. Hence, the increase in meat consumption is gender-differentiated. The frequency of meat consumption by women at present is shown in Figure 3.
- Fourth, all men said that the amount of meat consumed per meal has increased between 2015 and 2022. More meat is eaten per meal compared to what they did in 2015. The corresponding data for women is not available.

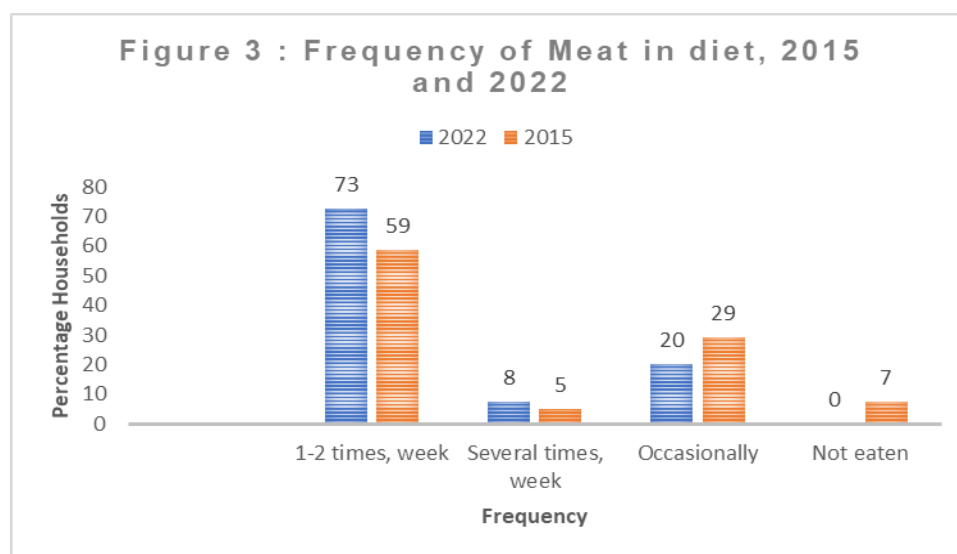


Figure 2: Frequency of meat in diet, 2015 and 2022

To summarise the main changes, the frequency of meat consumption increased between 2015 and 2024, but the increase is not proportionate to gender. The amount of meat consumed per meal has increased – but this is only reported by men. In the same period, overall milk consumption has declined.

The decline in milk consumption can be attributed to reduced production of this item due to loss of grassland and a reduction in animal rearing by 13% of the affected households. Project data indicate that as much as 56% of the local grassland area has been taken out of production to make way for construction activities. The decline in animal rearing is explained by the move of project affectees to urban and peri-urban locations where keeping ruminants is a problem. The majority of these families are now in the habit of purchasing powdered or liquid milk in the market.

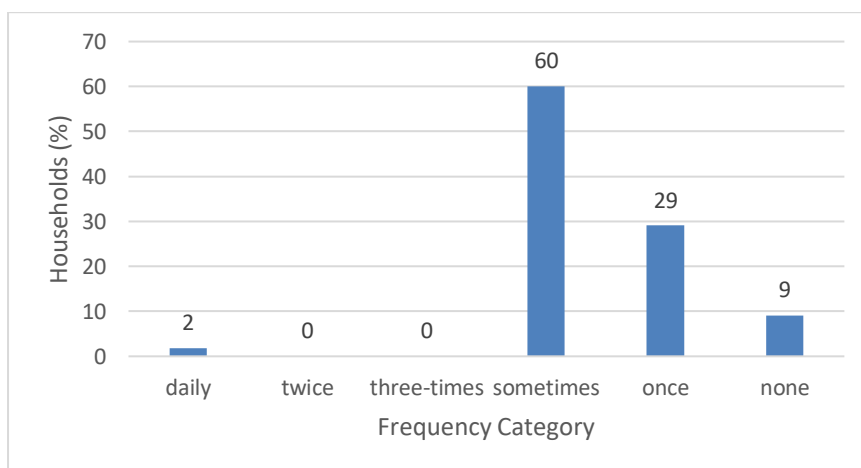


Figure 3: Frequency of meat-eating by women

Consumption of meat has increased due to the improvement of lifestyles following the receipt of a substantial cash compensation. This is in conformity with previous research which suggests that income growth is likely to cause an increase in meat consumption, among other items (Muhammad et.al., 2017). However, the increase is gender-differentiated due to the local custom where men have priority over women for high-value food.

### Consumption of eggs

According to survey data, in 2015 an average household consumed 239 eggs per month. By 2022 this figure had increased by 69% to 406. The egg consumption pattern is shown in Figure 4.

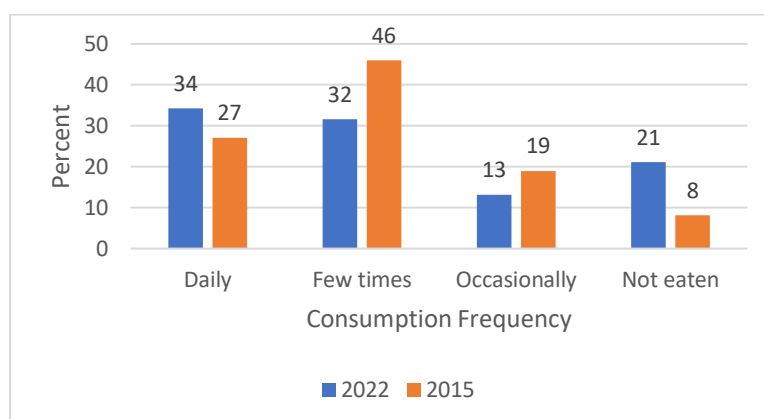


Figure 4: Frequency of egg consumption, 2015 and 2022



As with meat, consumption of eggs is again disproportionate to gender. For instance, 33% of women reported that eggs are not consumed weekly compared to only 21% men during 2022 and 2024.

### Food distribution within household

The women surveys investigated patterns of food distribution among household members. The socially accepted norms are:

- Food is purchased by men;
- Women are responsible for food preparation and serving;
- Food is served first to men, followed by children and girls and finally women.

The food pecking order was examined under two scenarios: first, who in the household gets to eat food first, and second, the order in which high-value food items such as meat and eggs are consumed within the household. With regard to the first issue, 69% of women said that their men are offered food first. The difference in the pecking order for boys and girls is minor but boys have slightly higher priority. On the second issue, men get preference in eating high-value food such as meat, eggs and fruit. 71% of women said that they do not get to eat adequate meat whenever it is cooked. According to them, the men and boys have priority in consuming meat and eggs.

After men and children have eaten, the remaining food, which is mainly staple items without meat or eggs, is available for women. Normal practice is for women to eat the left-overs together with some leafy vegetables picked from their kitchen gardens. Ownership analysis indicates that some 62% of women have access to kitchen gardens, which suggests that about 40% of women do not have access to fresh garden produce, an important item in household diets.

Few households reported eating fish, which reflects to low level of fishery resources in the area.

### Food adequacy

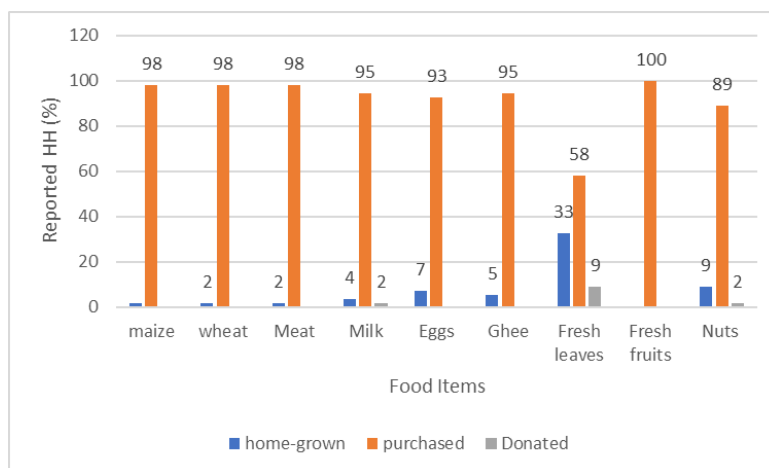
Food adequacy is an important determinant of a household's state of hunger. A deterioration in food adequacy means household members go hungry, unless food comes from their neighbours or friends by way of donation.

A majority (95%) of women said that they have enough food to eat or that the quantity needed can be easily purchased in the market, due to improved household incomes. Only 5% reported that they did not have enough food or sufficient income to purchase it. This 5% of poor households form a group of affectees with small land holdings or limited access to land, and consequently loss of these assets may have a significant effect on their food supply.

### Source of food

The two main food sources are home-grown and market purchase, depending on the type of food. Less than 5% of households reported receiving food as gifts or donations (the poor household referred to above).

Fresh fruit is purchased by all households. Over 90% of households depend on market purchase for seven food items, namely maize and wheat (the two staples), meat, milk, eggs, ghee (butter) and nuts. The only item which is mainly home-grown is leafy vegetables, reported by 33% of respondents, whilst 58% of households purchase some or all of their vegetable needs. 9% receive leafy vegetables as exchange or gifts. Figure 5 shows the distribution of food items by source, as reported by female respondents.



**Figure 5: Source of Food Items**

A plausible explanation for increased dependence on the market for staples, fresh fruits, nuts, vegetables and dairy items is the loss of local agricultural land due to project activities. According to data from the 2023 survey, 61% of the agricultural land which they previously owned had been taken out of crop and tree production to make way for construction activities. In parallel, 56% of rangeland of project affectees had been acquired by the project, leading to a shortfall in fodder availability. At the same time, 13% households had disposed of their livestock as they had opted to resettle in urban or peri-urban areas where facilities for animal rearing are unavailable. Furthermore, an estimated<sup>3</sup> 19,705 fruit (66%) and nut (34%) trees previously owned by affected households had been removed from within the project footprint, reducing fruit and nut production (an average of 6 fruit and nut trees removed from every affected household). All in all, project activities had caused a dwindling of the agricultural land base, making people dependent on the market for food items which hitherto had been produced on their own land. On a happier note, many affected households can now afford to purchase food since their incomes have increased by at least twice compared to before the project.

### Food composition

The composition of the diet is bread made out of either maize or wheat flour, meat of various sorts, milk-based preparations such as lassi, butter and ghee, eggs and a variety of local vegetables. In general, there was little change in the overall composition of meals between 2015 and 2024. All households eat bread, together with local vegetables (*saag*), meat and milk-based preparations, both then and now. However, many interviewees reported that they now eat more eggs for breakfast, a change that has occurred recently, a response to the improvement of their living standards.

Specific changes in food and dietary patterns that have occurred over the past eight years amongst affected households are summarised below:

- Household dependency on the market for the supply of milk, grain, fresh fruit, nuts and vegetables has increased. These items are affordable because household income has increased by several fold compared to conditions before the resettlement program.
- Maize flour (from locally grown crops) is preferred by elderly people whilst the preference of younger population is for bread made out of wheat flour, which is mainly purchased. Many respondents revealed that their kitchen prepares two types of bread, wheat bread for the younger people and maize bread for their parents and other elderly members.
- 98% of households purchase their staple food items, maize and wheat, as local production has declined.
- As of 2024, the amount of food consumed had increased and the quality of diets improved compared to

<sup>3</sup> Estimate based on data extracted from project file.

2015.

- More households (58%) purchase of fresh vegetables in recent years compared to none in 2015.
- An average of 6 fruit and nut trees per affected household have been removed, reducing local production of fresh fruit and nuts.
- The consumption of milk has declined mainly due to a reduction in animal numbers and the number of households engaged in livestock husbandry.

As regards processed food, the study area is in a remote location and local people have yet to develop the processed food habits and dependencies typical of wealthier societies. Consequently, no data is presented on this topic in this study.

### Eating out

In line with O’Shaughnessy’s findings (2017), this study found an increase in eating-out at cafés and restaurants associated with people devoting more time to paid work and business activities. Affected households with members in paid employment have increased in number, household cash incomes have doubled in real terms and people are opting for a more urbanized lifestyle. These changes have triggered new eating-out habits – but only for men, since local customs do not allow women to visit public places such as markets, cafés and restaurants. The changes in men’s eating-out frequency between 2015 and 2022 is shown in Figure 6. The main changes have been:

- 2015: no men dined out daily; 2022: 11% reported eating-out daily.
- 2015: men eat-out with family; 2022: 71% report eating-out with friends.
- 2015: 65% eating-out once a week; 2022: 30% eating-out once a week.
- And in parallel: 2015: 30% eating-out several times a week; 2022: 55% eating-out several times a week.
- The proportion never eating-out remained the same between 2015 and 2022.

As mentioned earlier, the change in eating-out behaviour is a direct result of busier lifestyles brought about by greater employment and business activity. The changes are directly attributable to the hydropower project.

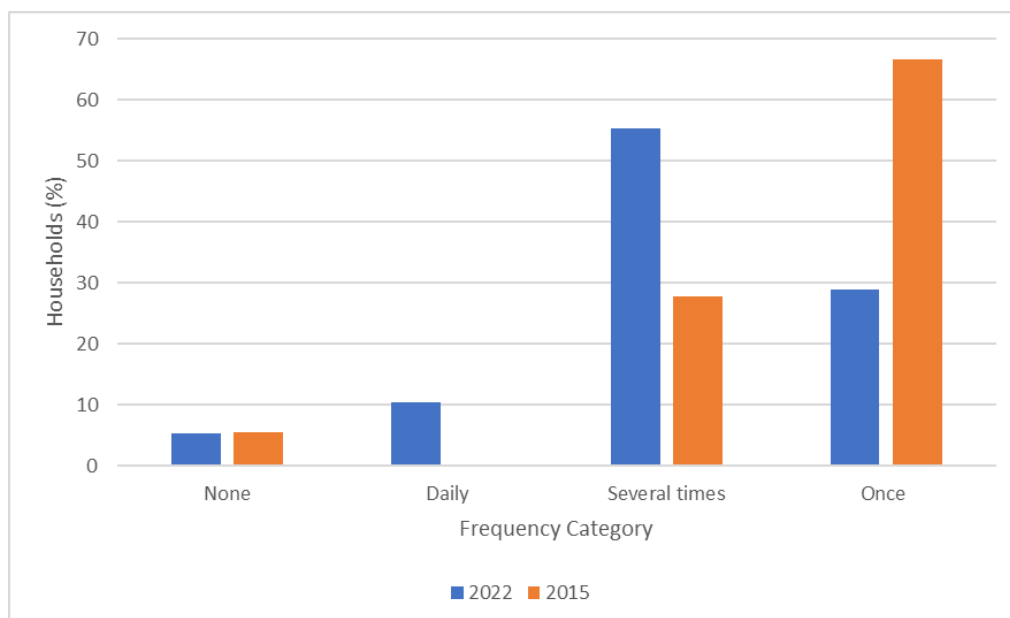


Figure 6: Frequency of Easting-Out, 2015 and 2022

Between 2015 and 2022, five changes in restaurant features and customer behaviour have been observed:

- The number of restaurants in Komila town has doubled.
- The range of cuisine on offer and the number of dishes served have both increased. Previously, mainly chicken or beef was available, with only one or two different dishes on the menu. Currently, a variety of meat types - chicken, beef and mutton - are on offer with more prepared dishes as well. According to the survey's male respondents, restaurants are serving tasty dishes they have never experienced before. The market also offers a greater range of snacks, the latest addition being traditional Pakistani tea with fresh milk, served in two cafés.
- The price of a meal has increased significantly, in response to increased demand and general inflation in food prices. In 2015 the average price of a meal was PKR 20-25, but in 2022 it stood at PKR 255.
- Hygiene standards in restaurants have improved since 2015. Restaurants are cleaner, tables are cleaned regularly, waste bins are provided, and more cleaning staff are engaged. Overall, interviewees consider the improvement in cleanliness to be about 35%.
- The number of customers has increased about threefold, as expected due to lifestyle changes (more people in employment, improved connectivity, more friends) and enhanced purchasing power.

### Food value chain changes

The surveys found three changes in food value chains between 2015 and 2024:

- The availability of fresh items has improved. In the past, fresh vegetables and fruit were available 3-4 times a week compared to a daily supply now.
- The number of fruit and vegetables sales outlets has increased, both permanent stalls and a new feature since 2020, mobile shops (truck sales). Truck operators do not incur the overheads of permanent stalls and their produce is generally fresher, cleaner-looking and cheaper.
- The number of meat (beef and mutton) sales outlets has increased, from just one in 2015 to as many as five in 2024. There was no mutton shop in Komila earlier, but now two outlets are operational. The number of shops selling chicken increased by a factor of three, from six prior to 2015 to as many as 17 in 2024.

### Dietary habits and food patterns: reasons for changes

As stated before, household food behaviour has improved in three ways: overall food consumption has increased (both frequency and quantity), the intake of high-value food items (eggs and meat) has increased and food purchase has become dominant. The increase in food consumption levels is primarily attributable to improved cash flow and household income between 2015 and 2024. When cash flow increases food is more affordable, leading to a rise in consumption. An overwhelming majority of respondents (95%) cited an increase in cash flow as the primary reason for better food affordability.

As discussed earlier, the increase in household cash flow is due to three factors: receipt of resettlement allowances and cash compensation for assets, new employment opportunities created by the project and increased business opportunities (17% of women respondents said that an increase in business activity had pushed their cash flow up, often referring to examples such as renting houses and other buildings, renting vehicles and an increase in associated services).

When food is affordable, the tendency is for people to spend more of their income on consumer goods, of which food is the priority. Thus, the results of this study are in conformity with Engel's law<sup>4</sup> which states that food is a normal good with an income elasticity of demand between 0 and 1 (Babu S.C. et.al, 2017).

---

<sup>4</sup> An economic theory that states that as a household's income increases, the total amount spent on food increases even though the percentage of income spent on food decreases.

Another factor that has influenced dietary and food consumption patterns in the study area is cultural change. 79% of respondents in the 2022 survey said that a change of attitude in the local population had occurred due to association with non-local workers who had come to the project area from developed parts of the country. The local and non-local workers share about 10 hours of their time at work sites, seven days a week. They live in the same camp, sharing accommodation, meals and recreational activities. The continuous mixing has facilitated cultural exchange, paving the way for changes in food-related attitudes and behaviour. The changed attitudes extend to other spheres such as children's education and the enrolment of girls in school (MSC, 2023). These are significant behavioural changes resulting from temporary in-migration for construction of the project. These findings confirm previous research which shows that dietary intake and food consumption patterns are affected by social factors such as influence by peers (Kabir, 2018; Clohessy, 2019).

## CONCLUSIONS AND RECOMMENDATIONS

This study, the first of its kind in the project area, has uncovered a wealth of information about household food consumption, dietary composition, dietary patterns and food habits amongst the population affected by the Dasu Hydropower Project. Positive changes have been found in food consumption, dietary habits and food value chains between the pre-project (2015) and current (2024) periods. Improvements have been observed in two main areas: first, an increase in the quantity of starchy staples consumed, especially wheat, and secondly, an increase in the frequency of consumption of meat and eggs. Local residents in affected households in the project area now consume a meal with meat at least every week. Consumption of eggs has quadrupled. However, at the same time, consumption of fresh milk has declined. In relation to the food value chain, there has been a major increase in the retail meal sector with more cafes and restaurants, an improved cuisine, a wider variety of dishes on offer, and also a change in the market with a better supply of fresh fruit, vegetables and meat.

The study also found that food consumption is highly gendered, reflecting prevailing social norms in the highly patriarchal traditional Kohistani culture. Men retain priority within households to consume food in general and high-value food (meat and eggs) in particular. However, with improved household cash flow more women are reporting better access to food, a positive trend.

The literature suggests that a variety of factors contribute to changes in food consumption and nutrition such as increases in disposable income, urbanization, improved education, economic growth, social change, trade liberalization, etc. Of these, the two factors that are relevant in the context of the project area between 2015 and 2022 are income growth and social change (behavioural change and improved connectivity). The conclusion of the study is that dietary transition in the affected population has occurred and is the result of growth in household incomes and behavioural change. On this note, it can be argued that some local people's lifestyles have improved as a result of the hydropower project.

These findings verify the predictions made during the project's design phase: in 2012 the detailed design report forecast that (i) food would become less available for some households due to the acquisition of their agricultural land for project purposes, and (ii) that construction jobs and the resulting increase in income might nullify negative impacts on food availability due to loss of land (but did not highlight the potential role of compensation payments and cash allowances).

The study suggests three areas where practical action could be valuable:

- Promotion of local production of fruit, nuts, grain staples and vegetables through a program of plant distribution, horticultural extension and public engagement. Any such program should be gender-aware, with women likely to benefit significantly from support for improving the productivity of kitchen gardens.
- Promotion of improved livestock husbandry through awareness, training, education and livestock extension services, again in a gender-differentiated context.
- Continuous monitoring of food habits, dietary practices and changes in food value chain in the project area.

The study also suggests several areas where further research could be undertaken:

- Household nutrition (quality and adequacy) to identify areas for improvement and support.
- The food status of the poorest and most vulnerable households and their coping strategies to identify needs for and mechanisms for support.
- The food habits, consumption patterns and dietary intake of women and girls.

## REFERENCES

1. Andreas Chai (2018). Household Consumption Patterns and the Sectoral Composition of Growing Economies: A Review of the Interlinkages. Inclusive and Sustainable Industrial Development Working Paper Series, United Nations Industrial Development Organization.
2. Ashraful Kabir, Shahgahan Miah, Asraful Islam (2019). Factors influencing eating behavior and dietary intake among resident students in a public university in Bangladesh: A qualitative study. PLoS ONE 13(6): e0198801. <https://doi.org/10.1371/journal.pone.0198801>.
3. Babu, Suresh C; Shailendra N. Gajanan; and Arne Hallam, J (2017). Nutrition Economics: Principles and Policy Applications. Academic Press, Elsevier Inc.
4. Bandara, S., Kumara, T., Dharmadasa, S., & Samaraweera, R. (2021). Changes in Food Consumption Patterns in Sri Lanka: Food Security and Sustainability: A Review of Literature. Open Journal of Social Sciences, 9, 213-237. <https://doi.org/10.4236/jss.2021.910016>
5. Banerjee, A. V., and Duflo, E. (2007). The Economic Lives of the Poor. The Journal of Economic Perspectives, 21(1), 141-167. doi: 10.1257/089533007780095556
6. Centre for Excellence in Rural Development -CERD- (2023). Personal communication with the author.
7. Clements, K. W., Wu, Y., and Zhang, J. (2006). Comparing International Consumption Patterns. Empirical Economics, 31(1), 1-30. doi: 10.1007/s00181-005-0012-y
8. Dolislager, Michael James (2017). Food Consumption Patterns in Light of Rising Incomes, Urbanization and Food Retail Modernization: Evidence from Eastern and Southern Africa. A DISSERTATION Submitted to Michigan State University in partial fulfilment of the requirements for the degree of Doctor of Philosophy.
9. Drewnowski A, Popkin B.M, 1997) The nutrition transition: new trends in the global diet. Nutrition Review 1997; 55:31-43).
10. Food and Agriculture Organization (2011). Guidelines for Measuring Household and Individual Dietary Diversity. Food and Agriculture Organization of the United Nations. <http://www.fao.org/3/a-i1983e.pdf>
11. Gerbens-Leenes, P.W; Nonhebel, S; Krol, M. S. (2010). Food consumption patterns and economic growth. Increasing affluence and the use of natural resources <https://www.researchgate.net/publication/46380380>
12. Gun Roos and Ritva Prattala (1999). Disparities in food habits: Review of research in 15 European countries. Publication of the National health Institution Helsinki, Finland.
13. Hu FB. Dietary pattern analysis: a new direction in nutritional epidemiology. Curr Opin Lipidol. (2002) 13:3-9. doi: 10.1097/00041433-200202000-00002.
14. Kearney, J. (2010) Food Consumption Trends and Drivers. Philosophical Transactions of the Royal Society of London 2793-2807
15. Management Support Consultants (2023). Dasu Hydropower Project: Baseline Study Report. External Monitoring Report No. 06.
16. Management Support Consultants (2024). Women Health, Hygienic and Nutritional Issues in the Dasu Hydropower Project Area in Pakistan. External Monitoring Report No. 09
17. Muhammad, Andrew, Anna D'Souza, Birgit Meade, Renata Micha, and Dariush Mozaffarian (2017). The Influence of Income and Prices on Global Dietary Patterns by Country, Age, and Gender, ERR-225, U.S. Department of Agriculture, Economic Research Service, February 2017.
18. Nippon Koi (2014). Public Health and Gender Action Plan, Dasu Hydropower Project, Pakistan.
19. O'Shaughnessy, Niamh (2017). The Changing Face of Global Eating Patterns. [https://khni.kerry.com/wp-content/uploads/2017/03/The-Changing-Face-of-Global-Eating-Patterns\\_FINAL.pdf](https://khni.kerry.com/wp-content/uploads/2017/03/The-Changing-Face-of-Global-Eating-Patterns_FINAL.pdf)

20. Shantana Halder and Ian Urey (2003). Changing Food Consumption Patterns: Implications for Nutrition and Livelihoods. Research and Evaluation Division, BRAC BRAC Centre, Dhaka
21. Sophie Clohessy, Lukasz Walasek, Caroline Meyer (2019). Factors influencing employees' eating behaviours in the office-based workplace: A systematic review. *Obesity Reviews*, vol 20, issue 12, December 2019. <https://doi.org/10.1111/obr.12920>
22. United Nations (2015). Transforming Our World: The 2030 Agenda for Sustainable Development. [www.sustainabledevelopment.un.org](http://www.sustainabledevelopment.un.org)
23. Wadkar SS, Kshirsagar PJ, Mali V (2017) Economic Analysis of Food Consumption of Farm Families in Ratnagiri District (MS). *Food Nutrition J* 2: 158. DOI: 10.29011/2575-7091.100058.