CGIAR BETTER DIETS AND NUTRITION

Intake of Aquatic and Terrestrial Animal Source Foods among Women of Reproductive Age in Northern Tanzania

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Introduction

Aquatic foods and terrestrial animal source foods (TASF) provide crucial nutrients that build and maintain muscle mass and function [1]. These foods are particularly rich in essential micronutrients, including iron, zinc, vitamin A (as retinol), vitamin D, and vitamin B12, as well as essential fatty acids. Notably, vitamin B12 is found almost exclusively in TASF and some aquatic foods, underscoring their importance in diets. Compared with plant-sourced protein foods, aquatic foods and TASF generally provide micronutrients in more bioavailable forms, which is critical for populations at risk of micronutrient deficiencies [2]. However, aquatic foods and TASF have a higher environmental footprint than plant-sourced protein foods, requiring diversified strategies to meet global dietary needs under increasing environmental pressures [3].

Globally, two servings of aquatic foods and TASF are recommended per adult per day—one serving of dairy (250 g/day or 145 kcal/day) and one serving of non-dairy (~90 g/day or 150 kcal/day) [3]. Likewise, the Tanzania Food-Based Dietary Guidelines (FBDG) recommend two servings per day for adults, equivalent to 120-200 g/day or 270 kcal/day, without explicit recommendations for food sources of each serving [4]. While all regions of the world, except South Asia, overconsume aquatic foods and red meat, consumption of other TASF is well below recommended amounts [3]. The lowest adult intake has been documented in Sub-Saharan Africa, where intake of aquatic foods and TASF averaged one serving per day in 2018 [5], half of the recommended global amount [3]. As a result of this low intake, combined with low intake of other nutrient-rich foods, population groups with higher nutrient requirements, such as pregnant women and women of reproductive age (WRA), are at risk of some of the highest prevalences of micronutrient deficiencies.

Specifically, WRA in Sub-Saharan Africa have the second-highest prevalence (after South Asia) of iron and zinc deficiency [6]—nutrients found in the highest densities and most bioavailable forms in aquatic foods and TASF [7]. In Sub-Saharan Africa, maintaining or increasing aquatic foods and TASF intake remains an important strategy for addressing micronutrient deficiencies in WRA [2]. Simultaneous consideration of other nutrient-rich foods is needed, however, due to the known adverse health and environmental effects of consumption of certain aquatic foods and TASF like red meat [3].

The CGIAR Science Program on Better Diets and Nutrition (BDN) uses an end-to-end approach to increase intake of fruit and vegetables (F&V), aquatic foods, and TASF in Tanzania by addressing barriers across the agri-food system. The end-to-end approach aims to integrate demand-side, food environment, and supply-side interventions to enhance the affordability, accessibility, availability, and desirability of these foods. This approach initially focused on F&V, including addressing inadequate F&V production. BDN is now implementing and evaluating the end-to-end approach for F&V through an ongoing study in the Arusha and Kilimanjaro regions of Northern Tanzania. Using data from the baseline survey of this study, we previously reported that 1% of WRA met calcium and vitamin B12 requirements, and 68% and 72% met zinc and iron requirements, respectively [8]. In this research brief, we provide a deeper dive into WRA's intake of aquatic foods and TASF.

Methodology

Study area and sample

The evaluation of the end-to-end approach is being conducted in 33 villages across 5 districts in the Arusha and Kilimanjaro regions. WRA were eligible to participate if they were 15–49 years old, lived in one of the 33 study villages, had a biological child aged 10–14 years at enrollment, and provided written informed consent. Additional details on the study, including village and household selection, are detailed in the FRESH Research Brief 1. The data presented here are drawn from baseline face-to-face interviews conducted in Kiswahili between October 2023 and January 2024.

Dietary assessment and food groups

Dietary data were collected using a quantitative multi-pass 24-hour dietary recall. Current daily energy intake was calculated using the Tanzanian food composition table. Women who consumed <462 kcal/day (intake below the 1st percentile, n=26) or >5,965 kcal/day (intake above the 99th percentile, n=25) were excluded from the analyses due to suspected under-reporting or over-reporting, respectively. Additional details on the dietary assessments have been published previously [8]. We used the Global Diet Quality Score (GDQS) framework to define aquatic food and TASF subgroups: red meat, poultry and game meat, fish and shellfish, high-fat dairy, low-fat dairy, and eggs [9]. Only chicken and fish were reported within their respective subgroups, and low-fat dairy was consumed by only one woman. Therefore, these subgroups were renamed “chicken” and “fish,” and low-fat and high-fat dairy were combined into a single “dairy” subgroup.

The baseline survey also collected information on women’s socio-demographic characteristics. Household food security was assessed using the FAO Food Insecurity Experience Scale [10]. Household wealth quintiles were derived from a wealth index calculated using principal components analysis of 12 household assets and seven housing characteristics.

We first estimated the proportion of women reporting any intake, and the mean and median intake (g/day) of each aquatic food and TASF subgroup, overall and among women who reported any intake. We also estimated the mean number of servings consumed (g/day) and the proportion of WRA meeting the Tanzania FBDG recommendations. We then examined the proportion of women reporting any intake by women’s age and education, household food insecurity status, and household wealth quintile.

Results

Women in our sample were, on average, 38 years old (**Table 1**). About two-thirds (66.1%) had completed primary school, and about one-third (32.0%) of households were classified as severely food insecure.

Table 1. Women's socio-economic and demographic characteristics (N=2,547)

Characteristic	Mean ± SD or %
Age (years)	38.3 ± 6.2
Age group	
20-29 years	7.7%
30-39 years	48.1%
40-49 years	44.2%
Education status	
None/incomplete primary	18.8%
Primary (complete)	66.1%
Secondary/higher	15.1%
Household food security status	
No food insecurity	36.7%
Mild food insecurity	14.5%
Moderate food insecurity	16.7%
Severe food insecurity	32.1%
Household wealth status	
Household wealth index	0.0 ± 2.4

Current intake, overall

Overall, 79.1% of women reported intake of at least one aquatic food or TASF, with a mean intake of 141.4 g/day (**Table 2**). Dairy was the most consumed group, reported by 55.7% of women, with an overall mean intake of 100.8 g/day. Fish was consumed by 25.0% of women and red meat by 20.0%, with corresponding mean intakes of 15.9 g/day and 22.9 g/day, respectively. Intake of eggs or chicken was reported by <3% of women and was thus omitted from graphical presentations. In terms of servings, mean intake of aquatic foods and TASF was 1.0±1.3 servings/day, and 86.5% of WRA did not meet the Tanzania FBDG recommendations of 2 servings/day.

Table 2. Women's observed intake of aquatic and terrestrial animal source foods (N=2,547)

	Proportion reporting any intake (%)	Mean ± SD (g/day) Overall	Median (g/day)	25^{th}–75^{th} percentile (g/day)	Mean ± SD (g/day) among women reporting any intake
Overall	**79.1**	**141.4 ± 161.4**	**113.0**	**13.5 – 226.0**	**178.7 ± 162.0**
Dairy	55.7	100.8 ± 144.8	21.6	0.0 – 136.9	180.9 ± 152.1
Red meat	20.5	22.9 ± 66.3	0.0	0.0 – 0.0	111.9 ± 107.2
Fish	25.0	15.9 ± 49.9	0.0	0.0 – 2.1	63.5 ± 83.4
Chicken	0.4	0.4 ± 10.3	0.0	0.0 – 0.0	91.2 ± 133.5
Eggs	2.4	1.4 ± 14.8	0.0	0.0 – 0.0	58.3 ± 77.9

At the food item level, milk was the most reported item (51.3% of women), with a mean intake of 80.2 g/day **(Table 3)**. Beef (medium-fat, cooked) and sardines were consumed by 17.1% and 16.0% of women, respectively, though quantities were small. Boneless beef, yoghurt, and raw fish were less commonly consumed. Other food items were reported by <5% of women and not included in this summary.

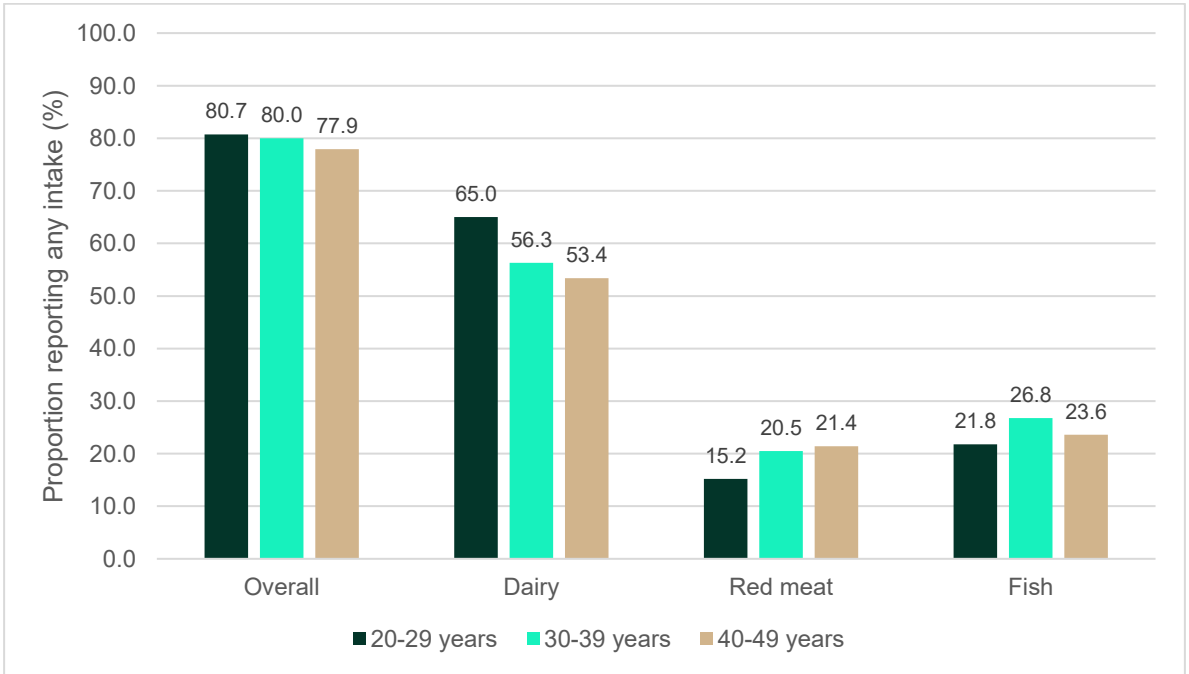
Table 3. Aquatic and terrestrial animal source food items, consumed by ≥5% of women (N=2,547)

	Proportion reporting any intake (%)	Median ± SD (g/day) Overall	Mean ± SD (g/day) among women reporting any intake
Milk	51.3	80.2 ± 116.2	156.3 ± 120.2
Beef, medium fat, cooked	17.1	15.2 ± 49.0	88.7 ± 86.5
Fish, sardines	16.0	6.0 ± 18.3	37.3 ± 30.4
Beef, boneless	6.7	5.2 ± 30.9	77.1 ± 93.4
Yoghurt, plain, whole milk	6.6	17.1 ± 79.4	260.5 ± 181.4
Fish, estimated using raw portion	5.5	6.8 ± 38.9	123.1 ± 115.3

Current intake, by socio-demographic characteristics

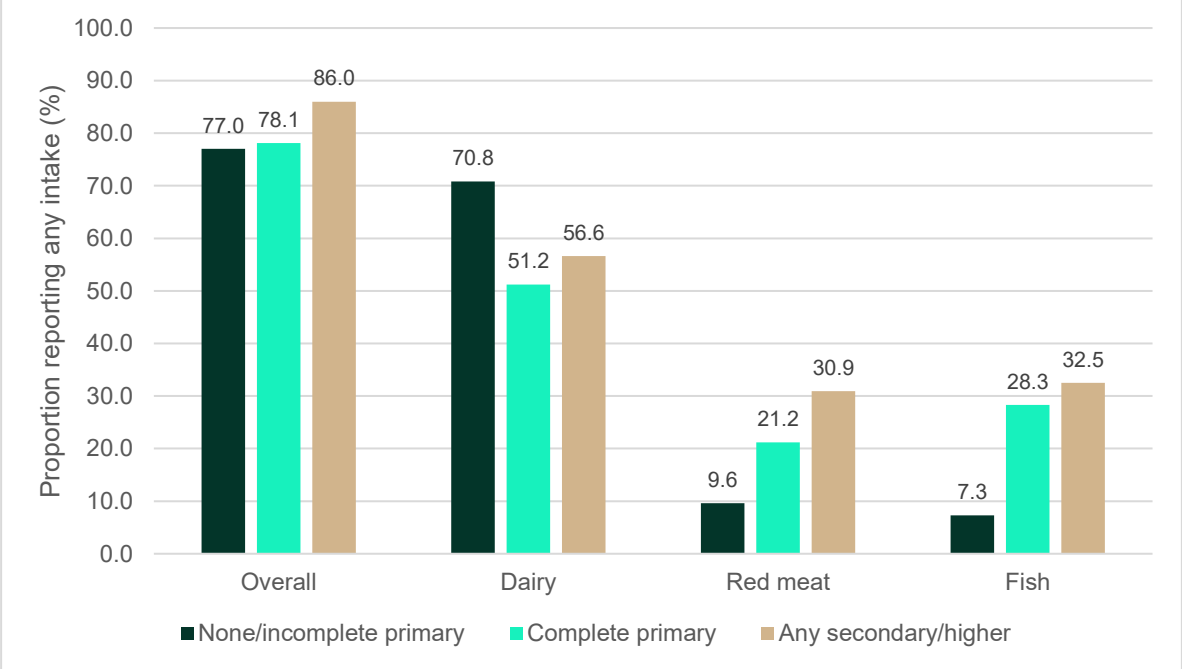
Across age groups, ~80% of women reported consuming any aquatic foods or TASF, with no meaningful variation observed between age groups (**Figure 1**). By GDQS subgroup, a higher proportion of 20–29-year-old women reported dairy intake than 30-39-year-old and 40-49-year-old women. Conversely, the proportion of women who reported any red meat and fish intake was lowest in the 20–29-year-old age group.

Figure 1. Proportion of women reporting any aquatic and terrestrial animal source food intake, by age group



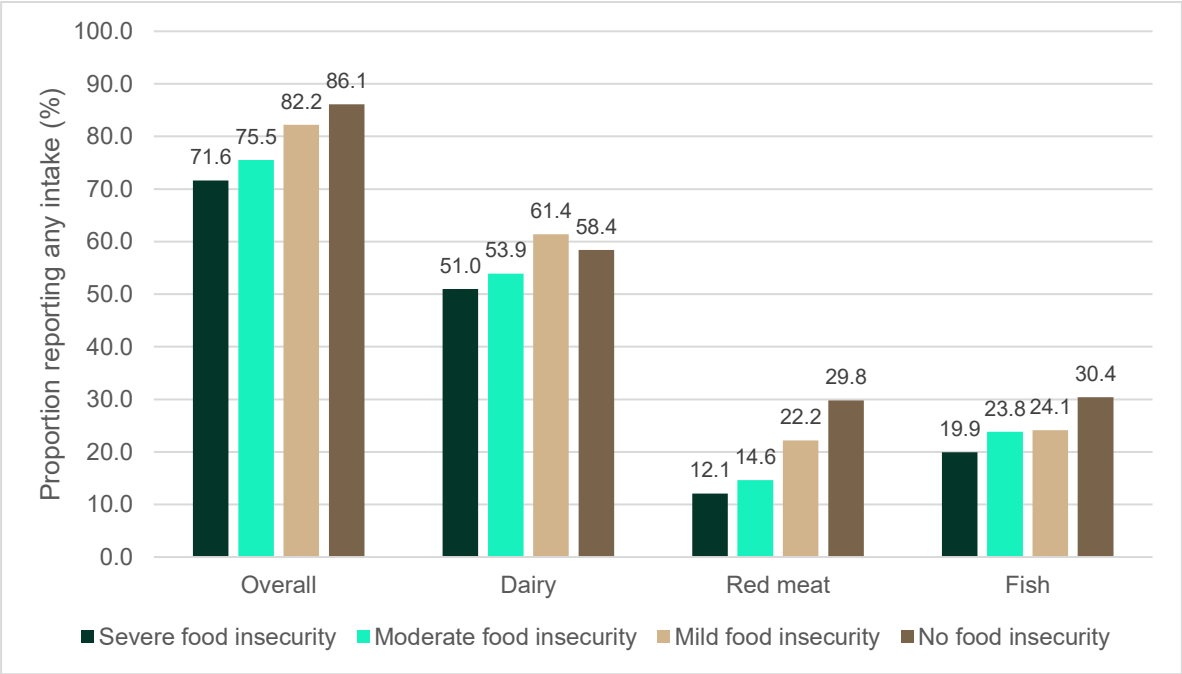
Education-related differences in aquatic foods and TASF intake were more pronounced (**Figure 2**). Women with at least some secondary or higher education, versus those with lower levels of education, were more likely to report any intake of aquatic foods or TASF. This trend was similar and more pronounced for red meat and fish intake, with women who had completed primary school or attained any higher education more likely to report any intake than women with no or incomplete primary education. The reverse trend was observed for dairy products: women with no or incomplete primary education were more likely to report any dairy intake than women with higher levels of schooling.

Figure 2. Proportion of women reporting any aquatic and terrestrial animal source food intake, by level of schooling



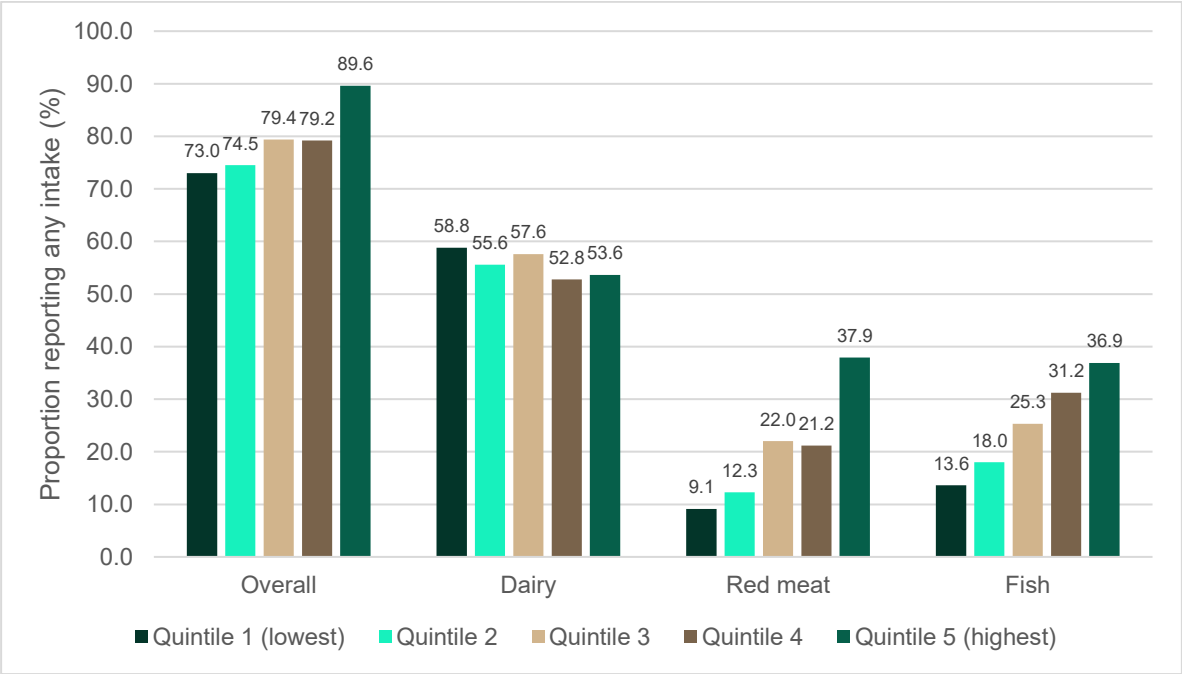
We also observed differences in aquatic foods and TASF intake by household food insecurity status. Women who were more food secure were more likely to report any aquatic food or TASF intake, with a difference of ~15 percentage points (pp) between WRA living in the most severely food insecure households and those in the most food secure households (**Figure 3)**. This pattern was consistent across all aquatic foods and TASF subgroups and was especially pronounced for red meat.

Figure 3. Proportion of women reporting any aquatic and terrestrial animal source food intake, by household food security status



Similarly, across household wealth quintiles (**Figure 4**), the proportion of women reporting any aquatic foods or TASF intake increased progressively from 73.0% in the lowest quintile to 89.6% in the highest quintile. This trend was most pronounced for red meat intake, followed by fish intake. The proportion of women reporting dairy intake did not differ by wealth quintile.

Figure 4. Proportion of women reporting any aquatic and terrestrial animal source food intake, by household wealth quintile



Key messages

- Intake of aquatic foods and TASF among WRA in Northern Tanzania is critically low, with the majority (86.5%) failing to meet Tanzania FBDG recommendations.
- Four in five women reported intake of at least one aquatic food or TASF, primarily dairy, red meat, and fish. Average intakes (g/day), however, were below recommended amounts.
- Milk was the most frequently reported individual food item (51.3%), whereas red meat, fish, yoghurt, and other items were consumed by relatively small proportions of women and in smaller amounts. Eggs and chicken were consumed by less than 3% of women in our sample.
- Socio-economic status was strongly related to aquatic foods and TASF intake. Women with lower educational attainment, higher household food insecurity, and lower household wealth were less likely to report any red meat or fish intake than women with higher educational attainment, less household food insecurity, and higher household wealth, respectively.
- Dairy intake varied less with household food security and household wealth. However, women with lower educational attainment were more likely to report dairy intake than women with higher educational attainment.

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Cover photo: WorldFish

About BDN

The CGIAR Science Program on Better Diets and Nutrition (BDN) identifies, co-designs and tests consumer-oriented solutions to ensure sustainable healthy diets for all while enhancing livelihoods, social equity, and environmental sustainability. Through evidence-based research and collaboration, BDN supports country-led food system transformation in low- and middle-income countries. To learn more about BDN, please visit https://www.cgiar.org/cgiar-research-porfolio-2025-2030/better-diets-and-nutrition/.

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