Agricultural Inputs & Harvest Among Vegetable Producers in Rural Sri Lanka

Insights from a baseline survey of the Fruit and Vegetables for Sustainable Healthy Diets (FRESH) end-to-end evaluation

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Introduction

Sri Lanka's agricultural sector plays a vital role in the food security and nutrition of its people. In recent years, overlapping crises, including the COVID-19 pandemic, severe economic collapse, climate-related shocks, such as cyclone Ditwah and subsequent flooding, and global political unrest have disrupted food systems and exacerbated food insecurity for Sri Lankans [1-4]. These challenges have constrained access to nutrient-rich foods, while increasing reliance on cheaper, less nutritious alternatives [5]. At the same time, Sri Lanka has been undergoing a nutrition transition characterized by increased consumption of ultra-processed foods and a double burden of malnutrition including micronutrient deficiencies and rising rates of overweight and obesity [6, 7].

Fruit and vegetables (F&V) are essential components of a healthy diet, providing critical vitamins, minerals, dietary fiber, and phytochemicals that support overall health and reduce the risk of malnutrition and chronic diseases [8]. Despite their importance, only 32% of Sri Lankan adults meet the World Health Organization's recommended intake of at least 400 grams of total F&V per person per day [9]. The Food Based Dietary Guidelines for Sri Lankans recommends 3-5 servings (approximately 240-400 grams) of vegetables per person per day, at least one of which should be green leafy vegetables, and 2-3 servings (approximately 240-320 grams) of fruits [10]. A recent study among rural agricultural communities, however, found that average intake of vegetables was 118 (±117) grams and that of fruit was 71 (±243) grams per adult per day [9, 11]. Factors including desirability, availability, accessibility, and affordability of fresh produce, in part driven by agricultural production, influence F&V intake. Therefore, understanding agricultural production patterns for vegetables in Sri Lanka is an important step in addressing low vegetable intake among its population.

The CGIAR Research Initiative on Fruit and Vegetables for Sustainable Healthy Diets (FRESH), now under the CGIAR Science Program on Better Diets and Nutrition (BDN), aims to: 1) increase the production of vegetables and intake of F&V by adopting an end-to-end approach that links interventions across the food system and; 2) evaluate these interventions. In Sri Lanka, FRESH, focuses on three complementary areas: demand-side interventions to increase the desirability of F&V among consumers; food environment interventions to enhance accessibility and affordability; and supply-side interventions to increase the year-round availability of safe and sustainably produced vegetables.

This research brief presents findings from the baseline survey of the FRESH Sri Lanka impact evaluation, with a focus on agricultural input-use and agricultural production among vegetable-producing households participating in the study. The findings of this brief will inform the ongoing supply-side interventions and enable adaptive learning and changes during their implementation.

Methodology

Study design and participants

The FRESH study design is a longitudinal cluster-matched and partially randomized controlled trial with five study arms: three in rural areas and two in urban areas. Districts and study areas included were strategically selected based on their importance as farming hubs in Sri Lanka. Farming and non-farming households were both eligible for inclusion in the study if there was a woman of reproductive age (20-49 years) who consented to participate. The study protocol was reviewed and approved locally and internationally by the Wayamba University of Sri Lanka Ethics Review Committee (No.: 202404H1) and the IFPRI Institutional Review Board (No.: NDH-24-0419MP). More details on the study design and the different FRESH demand, food environment, and supply interventions are provided in Research Brief #1 [12].

The sample for this brief was limited to farming households (1,277 of 2,870, 45%), defined as those households residing in rural areas and that reported operating agricultural land in the 12 months prior to the survey.

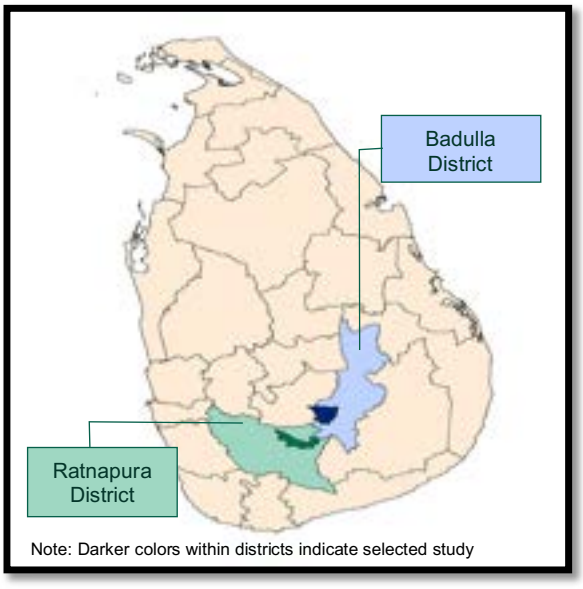
Although the sample is not representative at either the national or district level, it provides significant insights into vegetable production practices, agricultural inputs, and production outputs from two agroecologically different areas with distinct farming practices in Sri Lanka: Badulla in Uva Province and Ratnapura in Sabaragamuwa Province **(Figure 1)**.

Study setting

Badulla district is in the central highlands of Sri Lanka. Its up-country agroecology, characterized by elevations above 1,000 m, high rainfall (~1,700 mm annually) and cool temperatures, is well suited to temperate vegetable cultivation, including carrots, beans, and cabbages. Our sample from this district includes randomly selected households from rural areas in the Haldumulla, Haputale, and Welimada Divisional Secretariat Divisions.

Ratnapura district lies in the low-to-mid country wet zone of Sri Lanka. Lower elevation and a warm, humid climate favor rice cultivation, which is the primary livelihood activity among rural households in the area. Our sample includes randomly selected households from rural areas in the Balangoda, Kalthota, and Weligepola Divisional Secretariat Divisions.

Figure 1. Study locations



Data collection

Trained enumerators collected household survey data between June and August 2024 in local languages: Sinhala and Tamil. The agricultural modules were administered to household heads.

The household head's sex was recorded as either male or female and age was reported in completed years. The household head's total number of years of formal schooling completed and main livelihood activity (farming or something else) were captured. Information collected on household assets, dwelling characteristics, and ownership of durable goods was used to construct a household wealth index using principal component analysis as a composite measure of socioeconomic status; households were then classified into wealth quintiles based on the study sample distribution.

Agricultural inputs assessed included agricultural plot size (hectares) and land type (homestead, arable, bush/forest, riverbed, commercial plot). Seeds were classified as improved/ hybrid versus local/ traditional/ indigenous varieties. Fertilizers were categorized as inorganic versus organic. The number of pesticides used for each crop was reported separately. Irrigation sources were grouped into categories such as rainwater, river/ stream, tubewell/ agrowell, dam/ reservoir/ canal/ lake and pond/ tank/ spring/ anicut.

Data was collected on the production of at least 46 different vegetables known to be cultivated in Sri Lanka. Information on land, harvest, input use, and related practices were collected at the plot-crop level. Since most vegetables can be produced year-round, agricultural production and the related practices were not disaggregated by season but queried for the whole year.

Analyses

All analyses were conducted at the household level, with agricultural production data analyzed at the crop-level for each vegetable. It should be noted that most households did not cultivate solely vegetables, but some mixture of vegetables and fruit, rice, legumes and/or other crops. This brief focuses on all households who reported cultivating vegetables and the analyses presented are stratified by district to account for the farming systems.

The number of vegetable crops cultivated by households was computed for the 12-month period prior to the survey (June-August 2023 to June-August 2024) and the total quantity of each vegetable harvested was calculated in metric tons per hectare (MT/ha). The harvest was also compared to the national production for each district as reported by the Department of Census and Statistics of Sri Lanka, Agriculture and Environment Statistics Division for 2023 and 2024.The proportion of vegetables lost during the pre-harvest period and the proportion of the final harvest used for household consumption, sold in the market, given away or for other purposes were also estimated. Market orientation was defined as the ratio of total harvest sold to total harvest produced across all vegetables, with values ranging from 0 (subsistence farming with no sales) to 1 (commercialized farming where all harvest is sold).

Results

Characteristics of vegetable farming households

Of the 1,277 rural farming households in our sample, 73% (n=930) were involved in vegetable production (62% in Badulla, 38% in Ratnapura) (Table 1). In both districts, most vegetable farming households were male-headed, approximately half of the household heads' primary livelihood activity was farming, and nearly one-third were from the wealthiest quintile.

Agricultural input-use for vegetable production differed markedly between districts. Fertilizer use was nearly universal in Badulla (96%) but less prevalent in Ratnapura (72%), with the majority of users applying inorganic fertilizers in both districts. Pesticide use followed a similar pattern, with 77% of Badulla households and 65% of Ratnapura households reporting pesticide application. Arable land was the most common type of plot used for vegetable production in Badulla (66%), while in Ratnapura, homestead plots were most prevalent (66%).

In Badulla, 34% of households produced only vegetables, compared to 16% in Ratnapura. Conversely, production of leafy vegetables was more common in Ratnapura (16%) than in Badulla (6%). On average, households in both districts cultivated three different vegetables, with median land area under vegetable production of less than 0.5 hectare. Market orientation was higher in Badulla (median = 0.9) compared to Ratnapura (median = 0.7).

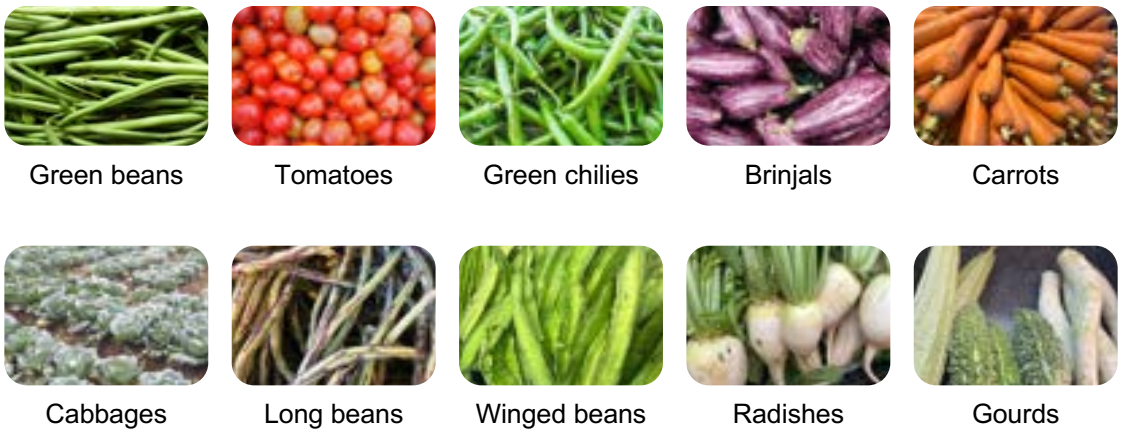
Table 1. Characteristics of vegetable farming households

	Badulla n= 580	Ratnapura n=350
Vegetable farming households, %	**62.0**	**38.0**
Male-headed households, n (%)	532 (91.7)	303 (86.6)
Household head is a farmer, n (%)	322 (55.5)	205 (58.6)
Years of schooling, mean (SD)	10.7 (2.5)	9.7 (3.1)
Age of household head, mean (SD)	52.1 (11.4)	50 (12.4)
Wealth index, n (%)		
Poorest	38 (6.6)	31 (8.9)
Below average	90 (15.5)	52 (14.9)
Average	111 (19.1)	76 (21.7)
Above average	154 (26.6)	92 (26.3)
Wealthiest	187 (32.2)	99 (28.3)
Agricultural inputs and outputs		
Any fertilizer use, n (%)	558 (96.2)	251 (71.7)
Inorganic fertilizer use, n (%)	524 (94.6)	225 (91.8)
Any pesticide use, n (%)	504 (86.9)	228 (65.1)
Land under vegetable production (ha), median (IQR)	0.4 (0.2-0.9)	0.4 (0.2-0.8)
Land under any agricultural production (ha), median (IQR)	0.6 (0.3-1.2)	0.8 (0.4-1.4)
Type of land under vegetable production, n (%)		
Homestead	290 (50)	230 (65.7)
Arable	385 (66.4)	149 (42.6)
Bush/forest	2 (0.3)	5 (1.4)
Land in riverbed	0 (0)	3 (0.9)
Other residential/commercial plot	5 (0.4)	0 (0)
Other plot	4 (0.4)	0 (0)
Household produces only vegetables, n (%)	256 (34.1)	82 (15.6)
Household produces leafy vegetables, n (%)	42 (5.6)	82 (15.6)
Number of vegetables produced, mean (SD)	2.7 (1.8)	2.5 (1.7)
Market orientation, median (IQR)	0.9 (0.7-1)	0.7 (0.3-0.9)

SD: standard deviation; IQR: interquartile range (25^{th} percentile – 75^{th} percentile); ha: hectare

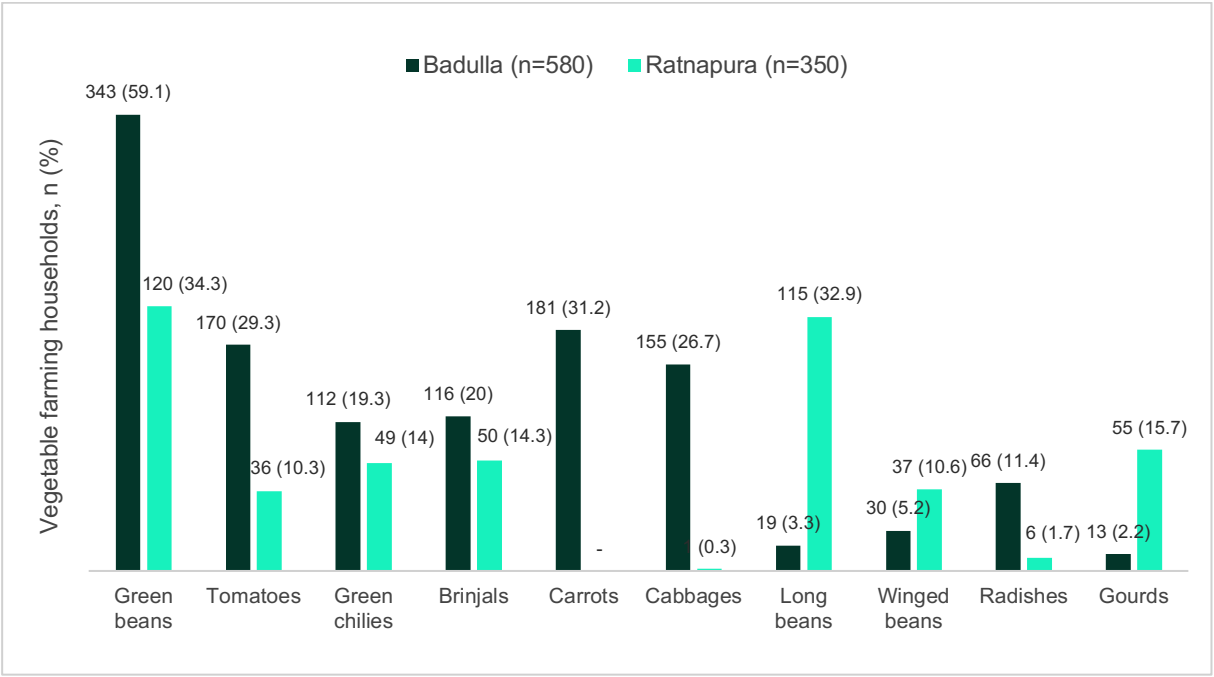
Commonly produced vegetables

A diverse range of vegetables were produced by the households in our study during the past year (June 2023 to August 2024). The most commonly produced vegetables across both districts included green beans, tomatoes, green chilies, brinjals (also known as eggplant or aubergine), carrots, cabbages, long beans, winged beans, radishes, and gourds (including ridge gourd, bitter gourd, and snake gourd).



The types of vegetables produced varied by district (Figure 2). In Badulla, green beans were the most widely cultivated vegetable (59%), followed by carrots (31%), tomatoes (29%), and cabbages (27%). Green bean production was also popular in Ratnapura (34%). Long beans were the second major crop in Ratnapura (33%), unlike in Badulla where only 3% cultivated them. Notably, carrot and cabbage production were virtually absent in Ratnapura, while both crops were widely grown in Badulla. Conversely, long beans, winged beans and gourds were more common in Ratnapura than in Badulla.

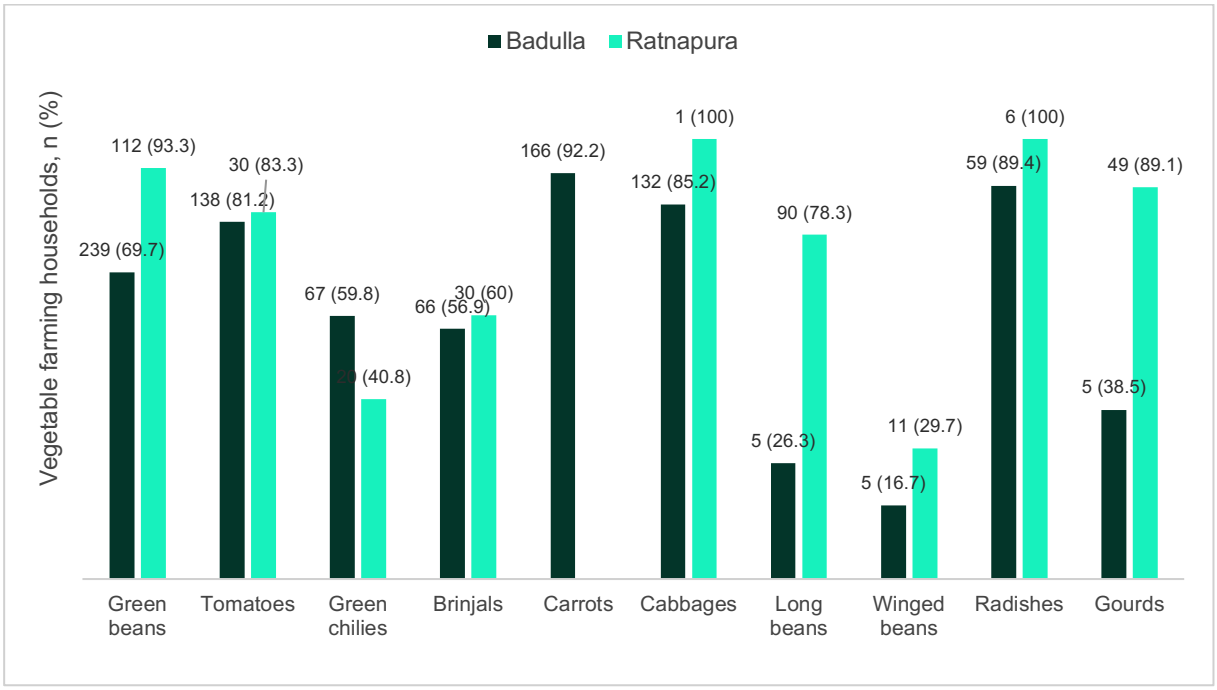
Figure 2. Vegetables produced by district between June 2023 and August 2024



Seeds

Adoption of improved or hybrid seeds varied modestly by vegetable and district **(Figure 3).** In Badulla, hybrid seed adoption was highest among producers of carrots (92%), radishes (89%) and tomatoes (81%) but low among those producing winged beans (17%) and long beans (26%). In Ratnapura, hybrid seed adoption was highest among producers of radishes (100%), green beans (93%), and gourds (89%), but was low among those producing winged beans (30%) and green chilies (41%). Overall, improved or hybrid seed adoption was widespread in both districts and for most vegetables.

Figure 3. Vegetable farming households utilizing improved or hybrid seeds



Fertilizers

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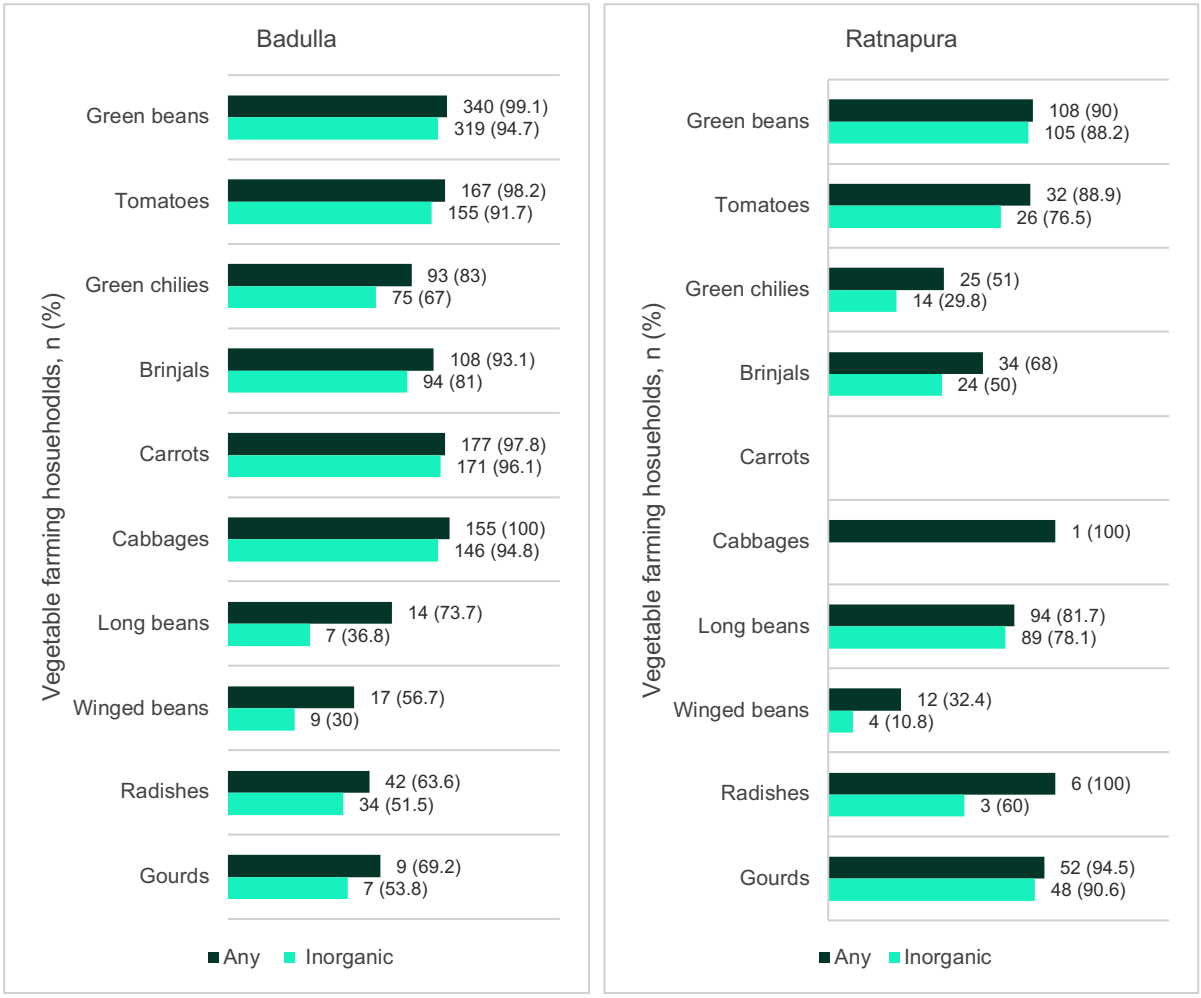
Figure 4. Fertilizer use among vegetable farming households



Pesticides

Pesticide use was almost exclusively synthetic in both districts, but application varied by vegetable and district **(Table 3)**. In Badulla, pesticide application was nearly universal among producers of cabbages, carrots, tomatoes, and green beans (92-94%) and common among producers of green chilies (60%) and brinjals (72%). Farming households used an average of two different pesticides per vegetable crop in Badulla. Conversely, in Ratnapura, pesticide use was highest among producers of gourds and green beans (~90% each), but lower among those producing green chilies (29%) and winged beans (5%). Overall, both the proportion of farming households using pesticides and the number of pesticides applied among those who reported using pesticides were higher in Badulla than Ratnapura, reflecting differential cultivation practices and pest and disease management.

Table 2. Pesticide use among vegetable farming households

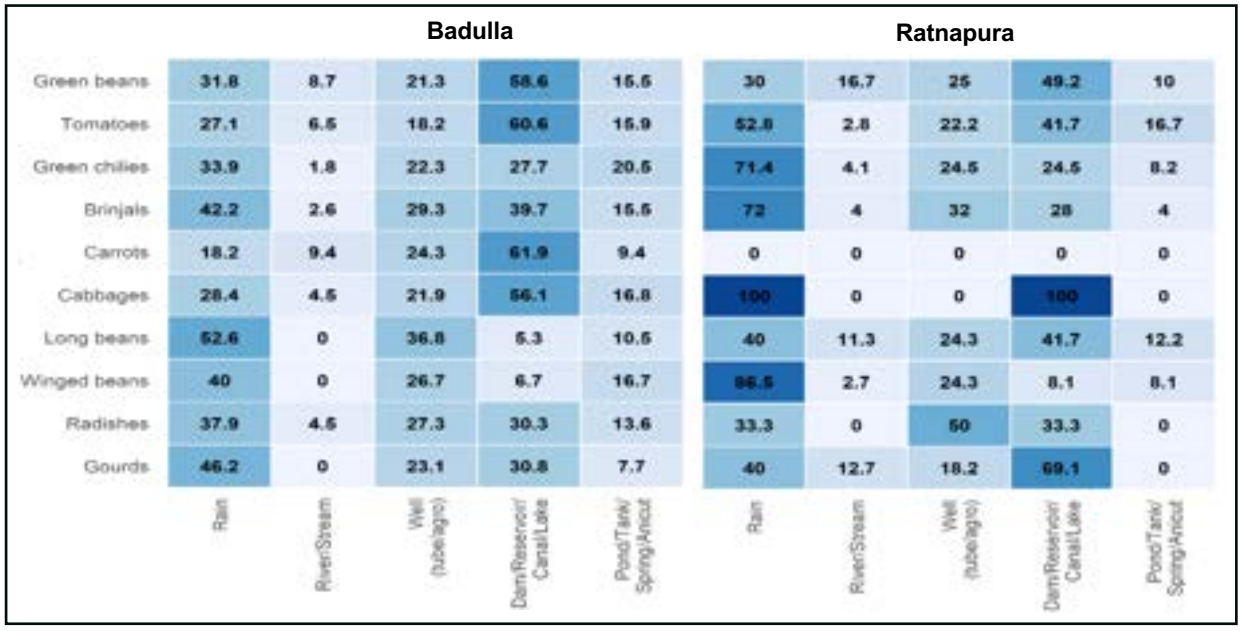
	Households, n (%)		Number of pesticides, mean (SD)	
	Badulla	**Ratnapura**	**Badulla**	**Ratnapura**
Green beans	318 (92.7)	108 (90)	2.1 (1.5)	1.4 (1.4)
Tomatoes	159 (93.5)	28 (77.8)	2.2 (1.6)	1 (1.2)
Green chilies	67 (59.8)	14 (28.6)	1.1 (1.2)	0.1 (0.4)
Brinjals	84 (72.4)	22 (44)	1.5 (1.6)	0.4 (0.9)
Carrots	168 (92.8)	-	2.1 (1.5)	-
Cabbages	146 (94.2)	0 (0)	1.9 (1.1)	-
Long beans	2 (10.5)	84 (73)	0.1 (0.2)	1.1 (1.3)
Winged beans	5 (16.7)	2 (5.4)	0.2 (0.6)	0 (0.2)
Radishes	23 (34.8)	2 (33.3)	0.4 (0.5)	0.3 (0.8)
Gourds	4 (30.8)	50 (90.9)	1 (2)	1.9 (2.2)

-Implies no data because the vegetable was not grown or household did not use pesticide

Irrigation

In Badulla, farming households relied on diverse water sources, with the built infrastructure (including dams, reservoirs, canals, and lake systems) being primary for most vegetable crops (39-68%), supplemented by rainwater (27-53%) and tubewells or agrowells (17-36%) (Figure 5). Ratnapura showed greater dependence on rain for irrigation, particularly for winged beans (87%), brinjal (72%), and green chilies (71%). Across both districts, rivers and streams were not commonly used for irrigation.

Figure 5. Sources of irrigation among vegetable farming households (%)



Area under vegetable production

Most of the farming households in our sample from either district were small-holder vegetable producers. As summarized in **Table 3**, in Badulla, tomato production occupied the largest mean agricultural area (0.6 ha), followed by green beans (0.5 ha) and brinjals, carrots, and cabbages (0.2 ha each). In Ratnapura, tomatoes were cultivated on substantially larger plots (2.4 ha on average), although with high variability (SD = 13.3 ha), suggesting some farmers engaged in large-scale production. Long beans, winged beans, and gourds (0.2 ha each) were grown in Ratnapura, but the mean agricultural area used for the same in Badulla was negligible.

Table 3. Area under vegetable production (ha)

	Badulla	Ratnapura
Green beans	0.47 (4.45)	0.20 (0.17)
Tomatoes	0.57 (3.92)	2.40 (13.30)
Green chilies	0.14 (0.77)	0.11 (0.10)
Brinjals	0.24 (1.5)	0.14 (0.11)
Carrots	0.20 (0.18)	-
Cabbages	0.17 (0.14)	0.05 (0)
Long beans	0.03 (0.04)	0.17 (0.21)
Winged beans	0.03 (0.02)	0.18 (0.66)
Radishes	0.13 (0.17)	0.09 (0.06)
Gourds	0.05 (0.04)	0.23 (0.24)

Statistics represent mean (standard deviation) of land size
-Implies vegetable was not grown

Pre-harvest loss

The proportion of farming households that reported pre-harvest loss was high (up to 62%) **(Table 4)**. In Badulla, green beans had the highest prevalence (62% producers) and severity of pre-harvest loss (35% mean loss), followed by tomatoes, carrots, and cabbages (45-48% producers, 17-22% mean loss). In Ratnapura, gourds (62% producers, 32% mean loss) and green beans (60% producers, 34% mean loss) were most affected, while high post-harvest loss was also reported for tomatoes and brinjals (~56% producers, ~28% mean loss for both).

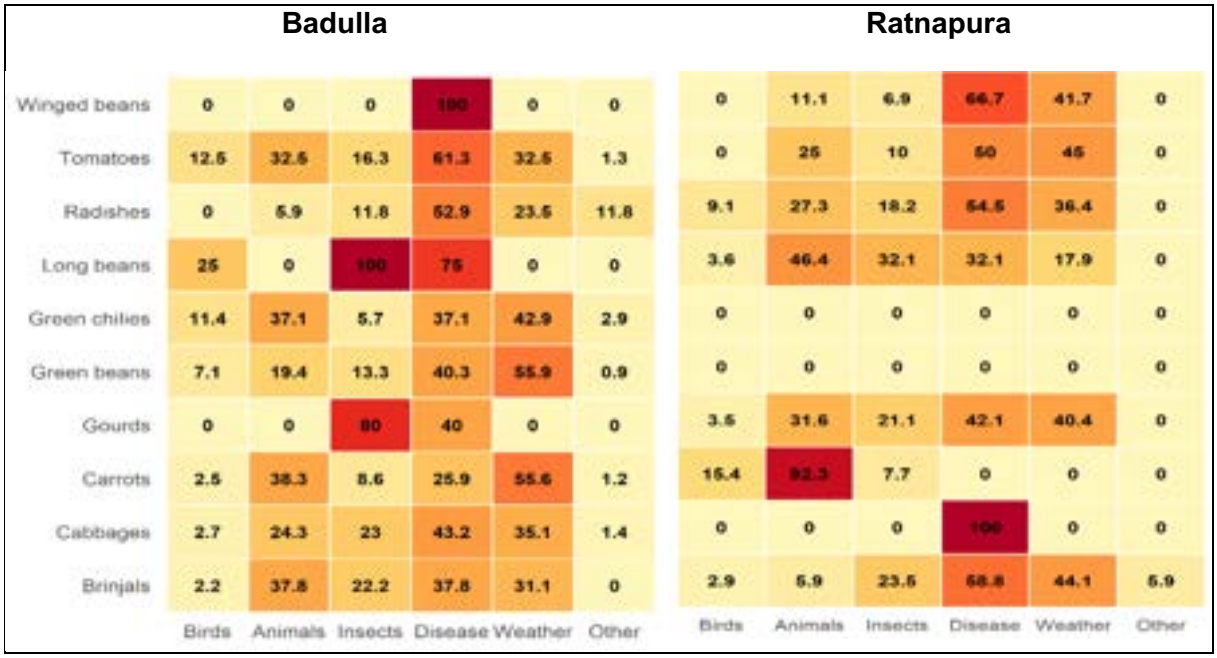
Table 4. Pre-harvest loss among vegetable farming households in 2023-2024

	Households, n (%)		Proportion lost, mean (SD)	
	Badulla	**Ratnapura**	**Badulla**	**Ratnapura**
Green beans	211 (61.5)	72 (60)	34.5 (36.1)	31.9 (34)
Tomatoes	80 (47.1)	20 (55.6)	21.8 (31.3)	23.6 (28.2)
Green chilies	35 (31.3)	22 (44.9)	13.5 (25.1)	21.5 (32.1)
Brinjals	45 (38.8)	28 (56)	16.7 (25.4)	20.7 (28)
Carrots	81 (44.8)	-	17.7 (26.8)	-
Cabbages	74 (47.7)	0 (0)	20.1 (28.8)	-
Long beans	4 (21.1)	57 (49.6)	8.4 (20.4)	19.9 (27.1)
Winged beans	1 (3.3)	13 (35.1)	0.2 (0.9)	11.8 (21.7)
Radishes	17 (25.8)	1 (16.7)	11.3 (21.7)	5.0 (12.2)
Gourds	5 (38.5)	34 (61.8)	10.0 (24.5)	31.7 (36)

-Implies no data because the vegetable was not grown or the household did not experience loss.

The primary causes of pre-harvest loss differed by vegetable and district (Figure 6). In Badulla, disease was the dominant cause of loss for most vegetables (37-61% producers), followed by weather for carrots, green beans, and cabbages (32-56% producers), while insects were the main threat for long beans (100% producers) and gourds (80% producers). In Ratnapura, disease remained the primary cause of pre-harvest loss (50-92% producers). Insects were also significant for producers of green chilies (55%), long beans (42%), and gourds (59%), while animal damage was the leading cause of pre-harvest loss among brinjal producers (46%). Additionally, adverse weather conditions such as droughts, strong winds, and floods contributed to pre-harvest losses among 40-45% of producers of green beans, tomatoes, and gourds in Ratnapura.

Figure 6. Causes of pre-harvest loss among vegetable farming households reporting losses



Harvest and utilization

Farming households achieved the highest mean harvest for tomatoes in Badulla (21 MT/ha) and for gourds in Ratnapura (42 MT/ha) **(Table 5)**. Interestingly, the harvest of tomatoes and brinjals in Badulla exceeded the district production averages in both 2023 and 2024 as well as the national production averages. However, the harvest of green beans, long beans, winged beans, and radishes were below both district and national production averages, while harvests of carrots, cabbages, and gourds were on par with district but not national production averages. A different pattern was observed in Ratnapura, where the harvest of green beans, long beans, and radishes exceeded district and national production averages, but harvests of tomatoes, brinjals, carrots, and cabbages fell significantly below the district and national production averages.

Table 5. Vegetable harvest among FRESH vegetable farming households compared to district and national average production in Sri Lanka (MT/ha)

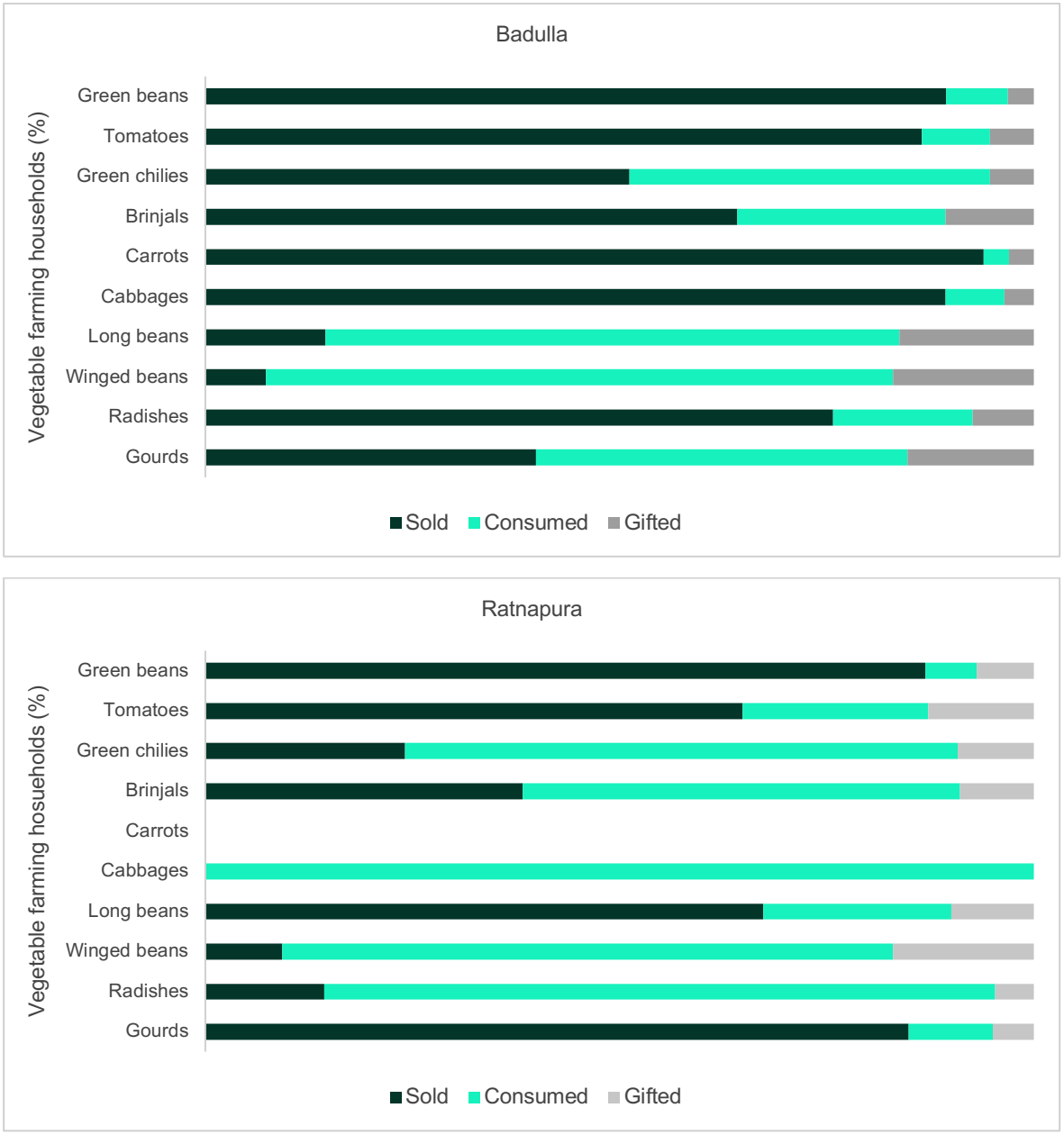
	FRESH Harvest, mean (SD)		Sri Lanka Production, mean[1]					
			2023			2024		
	Badulla	**Ratnapura**	**Badulla**	**Ratnapura**	**National**	**Badulla**	**Ratnapura**	**National**
Green beans	8.1 (13.7)	12.4 (16.7)	12.0	10.0	11.6	15.0	9.9	12.1
Tomatoes	21 (37)	12.5 (22.3)	10.8	18.4	14.5	10.7	17.2	13.5
Green chilies	4.1 (7.2)	3.5 (15.1)	7.9	4.8	5.6	7.6	4.1	5.4
Brinjals	13.7 (50.4)	3.6 (9.8)	8.4	14.7	12.2	8.9	14.5	8.6
Carrots	11.1 (21.6)	0 (0)	10.6	22.7	18.6	10.6	20.3	19.9
Cabbages	13.2 (18.5)	0.1 (0)	13.0	36.0	23.1	12.3	33.1	23.7
Long beans	2 (2.4)	12.1 (21.8)	5.3	9.1	8.1	7.5	8.5	8.2
Winged beans	1 (2.1)	0.4 (0.5)	4.5	11.5	9.4	4.7	11.6	9.2
Radishes	6.4 (11)	16.7 (40.2)	9.8	15.2	17.4	33.5	14.8	22.3
Gourds	7.1 (18.1)	42 (119.4)	7.6	14.6	10.6	-	-	-

[1] Department of Census and Statistics of Sri Lanka, Agriculture and Environment Statistics Division, 2023, 2024

-No data available

The proportion of harvest sold versus consumed or gifted were vegetable- and district-specific, reflecting different market orientations **(Figure 7)**. In Badulla, green beans, tomatoes, carrots, and cabbages were primarily sold (~80-85%), with minimal household consumption or gifting. Subsistence patterns emerged for other vegetables, with long beans and winged beans mostly kept for household consumption (~70-80%) and green chilies and brinjals showing balanced use between market sales and home consumption. Ratnapura showed lower overall market orientation. While green beans remained highly commercialized (~80%) along with gourds (~70%), most other vegetables were primarily kept for household consumption in Ratnapura.

Figure 7. Proportion of harvested vegetables sold, consumed and gifted among vegetable farming households



Discussion

This analysis of vegetable farming households at baseline reveals a clear agroecological divide between Badulla and Ratnapura that shapes production choices, input use, harvest, and market engagement. Badulla's highland farming system is characterized by intensive, commercially-oriented vegetable production, with near-universal fertilizer application and pesticide use, diversified irrigation infrastructure, and high market sales. Conversely, in Ratnapura, vegetable production is characterized by lower inputs, greater rainfall dependence, and production predominantly kept for household consumption. These structural differences are reflected in the distinct crop portfolios of each district, where temperate vegetables are more prevalent in Badulla, and lowland crops alongside rice cultivation more so in Ratnapura. Indeed, in our study, 30% of the farming households in Ratnapura produced rice compared to 10% in Badulla, with combined rice and vegetable production being twice as common in Ratnapura (18%) compared to Badulla (9%).

Across both districts, three constraints are noteworthy. First, reported pre-harvest losses were alarmingly high, affecting up to 62% of farming households for specific vegetables, although the affected vegetables were different by district. Second, harvests for some vegetables fell below district and national production benchmarks, though the contribution of pre-harvest losses and input use patterns to these gaps cannot be disentangled solely from the baseline data. Third, the high reliance on inorganic fertilizers and chemical pesticides raises questions about the long-term sustainability and resilience of current production systems, even if input use is not necessarily suboptimal given local conditions.

Several questions central to vegetable production remain unanswered by this baseline survey and will need to be explored as the evaluation progresses and implementation monitoring data become available. The causes of pre-harvest loss identified here, e.g. disease, adverse weather, and animal damage vary considerably by vegetable and district, but the relative contribution of each and the specific production contexts in which losses are most severe are not yet known. Understanding these dynamics will be essential for determining which loss-reduction strategies are most appropriate and for which farming contexts. Similarly, while yield gaps are documented here relative to district and national averages, it is unclear whether these reflect primarily agronomic constraints such as soil health, seed quality, crop management practices, or structural constraints such as limited access to adequate inputs, water sources, and agricultural extension services. Finally, the observed differences in market orientation between districts raise questions about the extent to which production constraints, rather than farmer preferences or market access, are limiting commercialization of vegetables in Ratnapura. Follow-up mixed-methods research will be important for addressing these questions and tracking how the production landscape shifts over the course of the evaluation.

Conclusion

This baseline assessment establishes the agricultural starting point against which the impact of FRESH supply-side interventions in Badulla and Ratnapura will be measured. The two districts represent structurally distinct farming systems — intensive and commercially-oriented in Badulla, subsistence-adjacent and rice-integrated in Ratnapura. Any intervention logic must account for this divide rather than treat them as a single context. Pre-harvest losses, yield gaps, and input use patterns documented here provide the benchmarks needed to detect changes and assess whether production conditions improve over the course of the evaluation. As implementation monitoring and follow-up data become available, the questions raised by this baseline about the drivers of loss, the sources of yield gaps, and the constraints on market participation can begin to be answered.

Key messages

Our study baseline data provides insights into current vegetable production patterns, key constraints, and opportunities for improvement. Although the sample is neither nationally nor district representative of farming households in Sri Lanka, the learnings will inform supply-side interventions in the farming communities of our study areas:

Production Patterns:

- An agroecological divide between highland Badulla and lowland Ratnapura shaped production. Badulla's high elevation and high rainfall together support intensive, commercially-oriented, temperate vegetable cultivation, while Ratnapura's lowland system allows vegetables primarily as a secondary, more subsistence-oriented activity.

Agricultural Inputs:

- Improved or hybrid seed adoption was high for most commercially-oriented vegetables, including carrots, tomatoes, and green beans, but low for winged beans in both districts and for long beans in Badulla, identifying these as potential priority targets for seed system strengthening.
- The prevalence of inorganic fertilizer and chemical pesticide use was high, raising questions about the long-term sustainability and resilience of agricultural input use patterns.
- Irrigation practices differed by district: Badulla farmers drew on diverse water sources, while Ratnapura showed high dependence on rainfall across multiple vegetables, indicating potential vulnerability to climate variability.

Harvest and Utilization:

- Pre-harvest losses affected up to 62% of farmers for specific vegetables. Disease, adverse weather, and pest damage were the dominant causes, though the relative contribution of each varied by vegetable and district.
- Yields relative to district and national benchmarks were vegetable- and district-specific: notable gaps below benchmarks were recorded for green beans, long beans, winged beans, and radishes in Badulla, and for tomatoes, brinjals, carrots, and cabbages in Ratnapura.
- In Badulla, green beans, tomatoes, and carrots were predominantly sold; in Ratnapura, most vegetables were retained for own consumption, with the exception of green beans and gourds.

REFRENCES

1. World Bank: **Sri Lanka: Systematic Country Diagnostic.** Washington, DC: World Bank; 2021.
2. World Bank Group: **Sri Lanka Development Update: Bridge to Recovery.** 2024.
3. Institute for Policy Studies of Sri Lanka: **Sri Lanka's Food Security after Cyclone Ditwah: Risk, Recovery, and Resilience.** Talking Economics; 2025.
4. **Iran war lands 'triple blow' to flood-ravaged Sri Lankans** [https://www.bbc.com/news/articles/c4gvkpj0024o]
5. Thibbotuwawa M, Tilakaratna G, Amarasinghe P: **Interlinkages between food price inflation, food security, and poverty in Sri Lanka: An empirical analysis.** Colombo, Sri Lanka: The Gamani Corea Foundation; 2025.
6. Koyratty N, Nwabuikwi O, Silva R, Hess SY, Olney DK: **Diets, Fruit and Vegetable Intake, and Nutritional Status in Sri Lanka: A Scoping Review.** *Maternal & Child Nutrition* 2026, **22:**e70157.
7. Margolies A, Craig H, Namara R, Sehgal M, Hemachandra D, Olney D: **Resilient Cities urban nutrition profile: Sri Lanka. Resilient Cities Country Profile.** Washington, DC: International Food Policy Research Institute; 2024.
8. Afshin A, Sur PJ, Fay KA, Cornaby L, Ferrara G, Salama JS, Mullany EC, Abate KH, Abbafati C, Abebe Z, et al: **Health effects of dietary risks in 195 countries, 1990–2017: a systematic analysis for the Global Burden of Disease Study 2017.** *The Lancet* 2019, **393:**1958-1972.
9. WHO: **STEPS Country Report Sri Lanka.** 2021.
10. Ministry of Health: **Food Based Dietary Guidelines for Sri Lankans: Practitioner's Handbook.** Sri Lanka: Ministry of Health, Nutrition Division; 2021.
11. Joyce CA, Caswell BL, Gelli A, Hess SY, Sitisekara H, Stewart CP, Tan X, Jayatissa R, Peiris K, Silva R, Olney DK: **Dietary intake and micronutrient adequacy among adults engaged in agriculture in rural Sri Lanka: findings from a cross-sectional baseline survey.** *Public Health Nutr* 2025, **28:**e35.
12. Koyratty N, Marshall Q, Kumar N, Silva R, Hemachandra D, Hess SY, Aheeyar M, Olney DK: **Improving fruit and vegetable intake and production in Sri Lanka: An evaluation of the FRESH end-to-end approach. FRESH Sri Lanka Research Brief 1.** Washington, DC: International Food Policy Research Institute; 2026.

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