

CHILD DIED OF STARVATION

◆ Jun 19, 2019: State Minister Dileep Wedaarachchi has instructed the Hambantota District Secretary to conduct an immediate investigation into the death of a 11-month old child in Tissamaharama.

◆ A post-mortem body had been found and died of starvation. District Secretary

◆ It is reported that the area could not be reached due to facing severe economic problems.

The number of poor in the country has increased to **02 million** in 2019.



In number of poor in 1995 there were **1.4 million**

DR. HETTIARACHCHI SAID THAT CHILD WASTING HAS STAGNATED AT 15.4 PERCENT OVER THE PAST 20 YEARS AND ADDED THAT THAT PERCENTAGE IS COMPARATIVELY HIGH IN INDIA, BANGLADESH AND NEPAL.

samaharama

antota

hunger

- **Are we food in(secure)?**
- **Do people who are living in the agricultural producing area have greater FS?**
- **Does market access really enhance the HDD?**



Market access, agricultural production, and household dietary diversity: A multi-indicator assessment using nationwide survey data from Sri Lanka

**Australian Conference of Economists (ACE)
2022**

**Presenter: Pilana Vithana Sajith Harshana
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Hobart, Tasmania**





Background and Literature Gap



Why is dietary diversity important for food security?

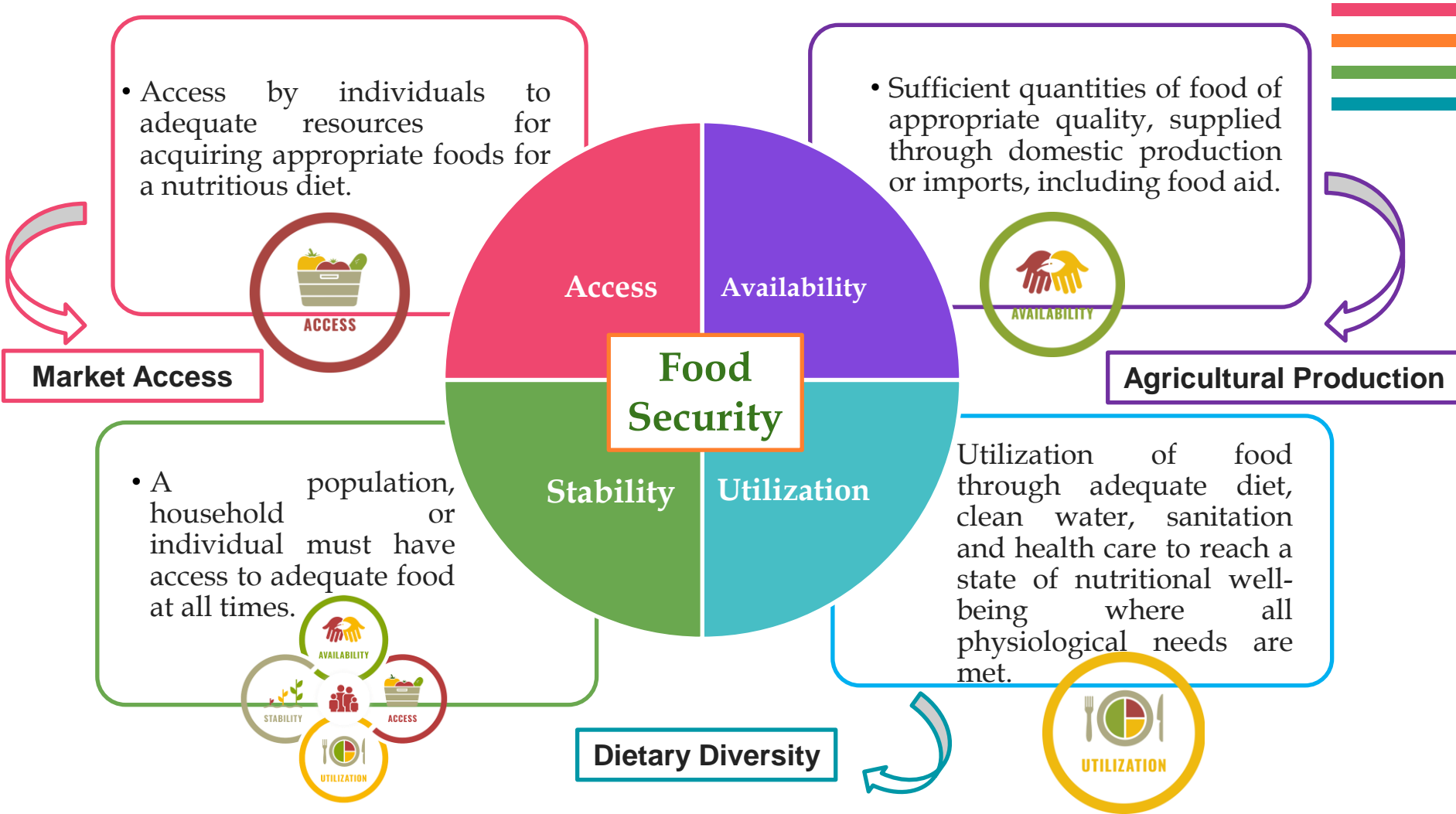
Food Security

Food Security exists when all people at all times have both physical and economic access to sufficient food to meet their dietary needs for a productive and healthy life.

(Committee on World Food Security, 2009)



In this sense, food security is a broad concept, which implies not only producing sufficient food, but also **making food accessible** to the entire population sustainably **throughout the year**.





Dietary Diversity

- **Dietary diversity** is used to measure the nutritional level of a group; and it is a proxy measure for food security (Hoddinott, 2002; WFP 2005; Harris-Fry *et al.*, 2015; Jones, 2017).

Empirical and data-related limitations:

- Sample sizes used in these studies are typically small/specify only a particular population segment (Codjoe *et al.*, 2016; Huluka & Wondimagegnhu, 2019; Mekuria *et al.*, 2017, Mahmudono *et al.*, 2017).
- Results of most previous studies were based on one general indicator
Eg- Dietary Diversity Score [HDDS] or Food Consumption Score [FCS]

(Kennedy *et al.*, 2010; Thorne-Lyman *et al.*, 2010; Taruvinga *et al.*, 2013; Codjoe *et al.*, 2016; Workicho *et al.*, 2016; Mekuria *et al.*, 2017; Mahmudiono *et al.*, 2017; Some & Jones, 2018; Huluka & Wondimagegnhu, 2019).





Agricultural Production

- Empirical studies on the relationship between agricultural production and dietary diversity have differing conclusions (Passarelli et al. 2018; Jaleta et al. 2018; Thompson and Meerman 2014). Gillespie et al., (2012) and Carletto et al., (2015), identify a positive relationship between agricultural production and dietary diversity. Anderman et al., (2014) however, identify it negative association.
- There is no single, direct, relationship between agricultural production and household dietary diversity and it is questionable whether people living in agricultural areas have greater access and availability to a variety of foods than people living in non-agricultural areas.
- This study also attempts to contribute to this inconclusive line of literature by having novel measures for agricultural production in the analysis.

Market Access



- Market access is often seen as a catalyst for greater dietary diversity
- Most previous studies have been limited to measures such as,

Distance to market

(Takeshima & Nagarajan, 2012; Sibhatu et al.,2015; Luckett et al.,2015; Snapp & Fisher, 2015; Qaim et al.,2016; Jones, 2017; Abay & Hirvonen, 2017; Hirvonen & Hoddinott, 2017; Qaim & Sibhatu, 2018; Weatherspoon et al.,2019; Huang & Tian, 2019; Onyeneke et al.,2019; Ntakyo & Van,2019)

Travel time to market

(Bellon et al.,2016; Koppmair et al.,2017; Stifel & Minten, 2017).

- There are inconclusive outcomes in market access and dietary diversity

Some previous studies have reported that **market access significantly affects household dietary diversity** (Luckett et al., 2015; Ludwig, 2018; Qaim et al., 2016; Sibhatu et al., 2015; Jones 2016; Koppmair et al., 2017; Lenjiso et al., 2016; Qaim et al., 2016; Sibhatu and Qaim 2018).

In contrast, other previous research has highlighted that **market access has not significantly affected on household dietary diversity** (Takeshima and Nagarajan, 2012; Chamberlin and Jayne, 2013; Berti, 2015; Sibhatu et al.,2015; Qaim et al., 2016 Ambikapathi et al. 2019).

- Further, there is a **lack of analysis** on market access and household dietary diversity in **developing countries**, especially in **Asian countries**.



Research Gap

Dietary Diversity- General Indicators, Limited sample size

Agricultural Production-No single, direct relationship

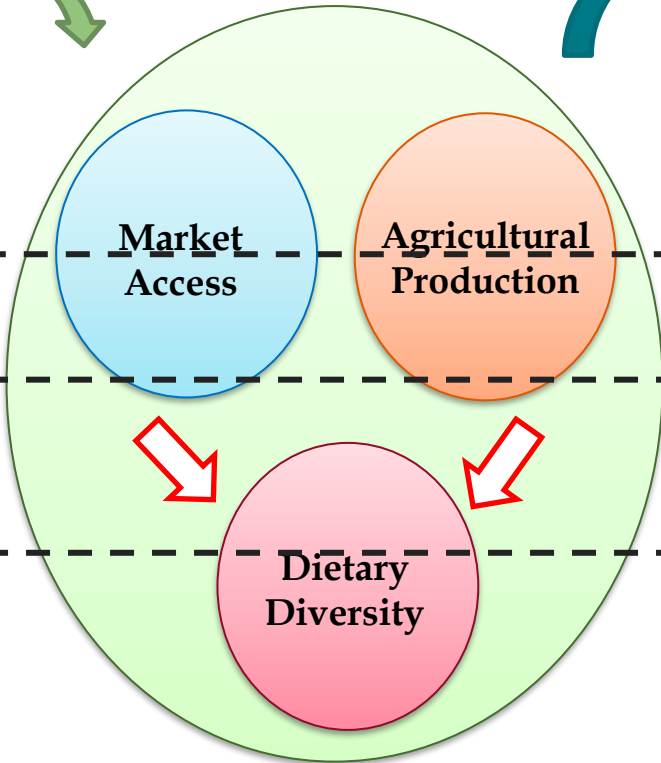
Market Access- General measurements, Inconclusive outcome

Novelty

Four indicators (HDDS, EI, HI and SI), 21755 sample

Developed agricultural production index

Novel measurement (registered food market shops per 1000 people)



This study attempts to contribute to this inconclusive line of literature by having novel measures for dietary diversity, market access and agricultural production in the analysis.



Methodology





Source of data

DD-Household Income and Expenditure Survey (HIES)
Market Access-Department of Census and Statistics



Sample size

21,755 housing units in Sri Lanka



Data analysis

Preliminary-Descriptive Statistics
Secondary-Principal Component Analysis (PCA)
OLS regression





- The food consumption reference period was 7 days.
- Quantities and values were provided for over 200 of the most commonly consumed foods.
- 12 subgroups- cereals, legumes and nuts, vegetables, fruit, tubers and roots, meat, eggs, fish and other seafood, milk and milk products, oil and fats, sweets, and miscellaneous (FAO, 2011).
- Paddy production (Mt), total vegetable production (Mt), field crop production (Mt), cow milk production (L), buffaloes milk production (L) and egg production (000) were considered to measure the agricultural production in each area.
- Then the Principal Component Analysis (PCA) was applied to elucidate the most relevant factors which affect agriculture production.
- Market access is measured by using a number of marketplaces per 1000 people. A number of registered retail shops, registered restaurants and canteens and registered meat, fish and vegetable shop are considered the main markets.

Measurements of dietary diversity



| Name of the Index | Formula of the index | Descriptions |
|--|------------------------------------|---|
| Household Dietary Diversity Score (HDDS) | $HDDS = \sum x_i$ | $i = 1, \dots, 12$ = 1 if the particular food group is consumed, = 0 if the particular food group is not consumed |
| Entropy Index (EI) or Shannon index | $EI = -\sum_{i=1}^n w_i \log(w_i)$ | w_i = weight of each food group |
| Herfindahl-Hirschman index (HHI) | $HI = \sum_{i=1}^n w_i^2$ | w_i = weight of each food group |
| Simpson index (SI) or Berry index | $SI = 1 - HHI$ | HHI is the Herfindahl-Hirschman index |

Regression analysis



$$HDD_i = \beta_1 + \beta_2(MA_i) + \beta_3(AP_i) + \sum_{k=1}^7 \beta_k X'_k + \varepsilon_i$$

$i = 1, 2, \dots, n$

Where ;

HDD= Household Dietary Diversity

MA= Market access (20 variables)

X' (Gender (1= Male, 2= Female), Age, Marital status (1= Never married, 2= Married, 3= Widowed, 4= Divorced, 5= Separated), Education (1= No school, 2= Primary, 3= Secondary, 4= Post-secondary, 5= Tertiary), Monthly household income (nonlinear form) , Monthly household food expenditure, Sector (1= Urban, 2= Rural, 3= Estate)



Results and Discussion



Table 1: Social and demographic characteristics

| Variable | Observations | Percentage (%) |
|---|--------------|----------------|
| Gender of the Head of the Household | | |
| Male | 16,128 | 74.13% |
| Female | 5,627 | 25.87% |
| Marital Status of the Head of the Household | | |
| Never Married | 483 | 2.22% |
| Married | 16,889 | 77.63% |
| Widowed | 3,654 | 16.80% |
| Divorced | 142 | 0.65% |
| Separated | 587 | 2.70% |
| Educational Level of the Head of the Household | | |
| No education | 752 | 3.46% |
| Primary education | 4963 | 22.81% |
| Secondary education | 12347 | 56.76% |
| Post-secondary education | 3055 | 14.04% |
| Tertiary | 638 | 2.93% |
| Age of the Head of the Household | | |
| Age categories (years) | | |
| ≤ 40 | 4908 | 22.56% |
| 41- 60 | 10277 | 47.24% |
| ≥ 61 | 6570 | 30.2% |
| Household size (number of household members) | | |
| ≤ 4 | 13730 | 63.11% |
| 5-8 | 7806 | 35.88% |
| ≥ 9 | 219 | 1.01% |
| Sector | | |
| Urban | 3428 | 15.76% |
| Rural | 17394 | 79.95% |
| Estate | 933 | 4.29% |
| Number of observations | 21755 | |



Table 2: Socio-economic characteristics

| Variables | Mean | Standard Deviation |
|---|-------|-----------------------|
| Monthly household income (LKR0,000) | 5.075 | 7.460 |
| Monthly total food expenditure (LKR0,000) | 1.999 | 0.977 |
| Monthly total non-food expenditure (LKR0,000) | 3.338 | 5.674 |
| Food expenditure ratio | 0.486 | 0.180 |
| N | 21755 | |

Table 3: Descriptive statistics of dietary diversity

| Variable | Mean | Std. dev. | Min | Max |
|------------------------|-------|-----------|-------|-------|
| HDDS | 9.578 | 1.838 | 0 | 12 |
| EI | 1.215 | 0.406 | 0 | 1.946 |
| HHI | 0.393 | 0.191 | 0.143 | 1 |
| SI | 0.607 | 0.191 | 0 | 0.857 |
| Number of observations | 21755 | | | |



Table 4: Mean values of the four diversity indices at different income levels

| Variable | Income level | | |
|------------------------|--------------|--------|--------|
| | Low | Middle | High |
| HDDS | 8.868 | 9.677 | 10.203 |
| EI | 1.129 | 1.226 | 1.291 |
| HHI | 0.424 | 0.388 | 0.367 |
| SI | 0.576 | 0.613 | 0.633 |
| Number of observations | 7373 | 7134 | 7248 |



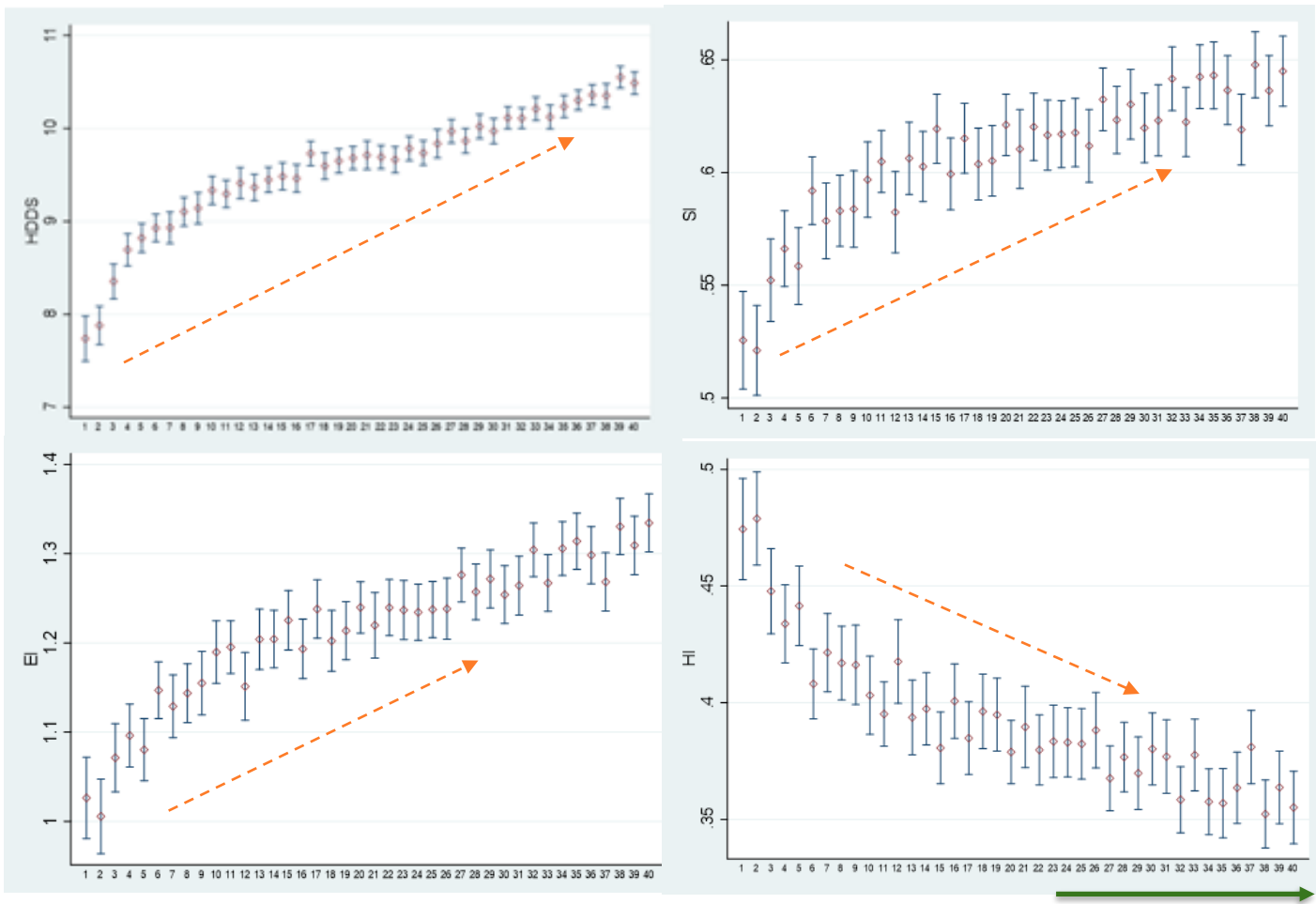
Table 5: Mean values of the four diversity indices of three different sectors

| Variable | Sectors | | |
|------------------------|---------|-------|--------|
| | Urban | Rural | Estate |
| HDDS | 9.888 | 9.524 | 9.447 |
| EI | 1.317 | 1.198 | 1.155 |
| HHI | 0.353 | 0.340 | 0.415 |
| SI | 0.647 | 0.600 | 0.585 |
| Number of observations | 3428 | 17394 | 933 |



Figure 1: Changes of mean values of the four diversity indices with income

Dietary diversity

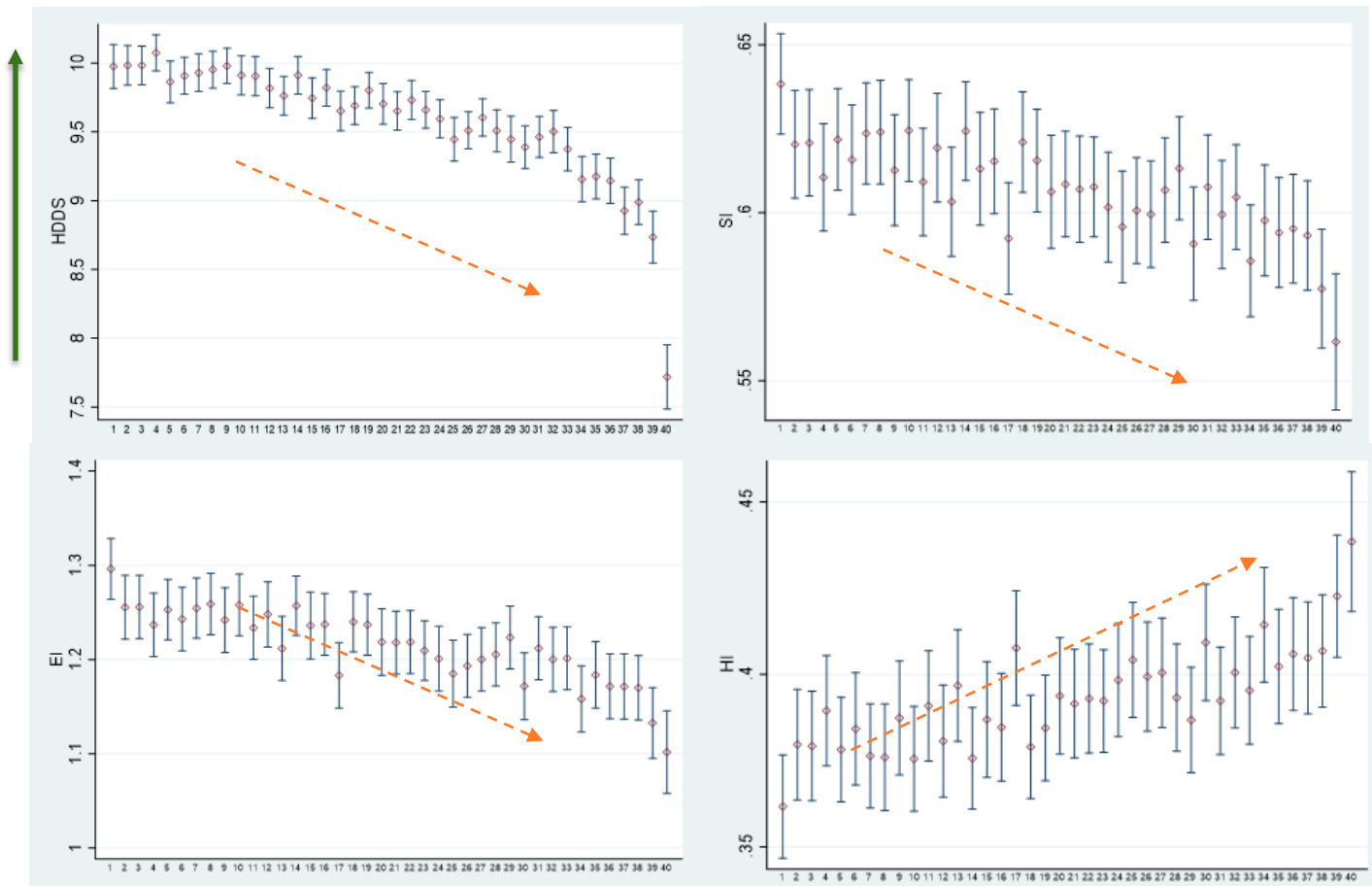


Income



Figure 2: Changes of mean values of diversity indices with food expenditure ratio

Dietary
diversity



Food
expenditure
ratio



Figure 3: Consumption of different food groups across income level

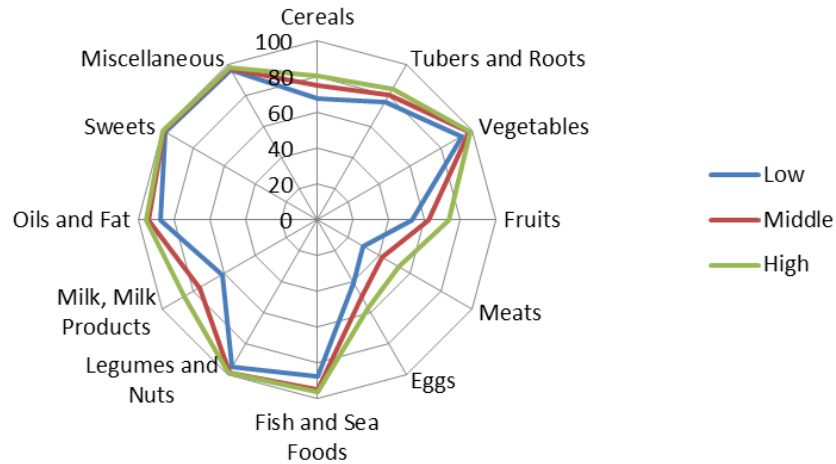
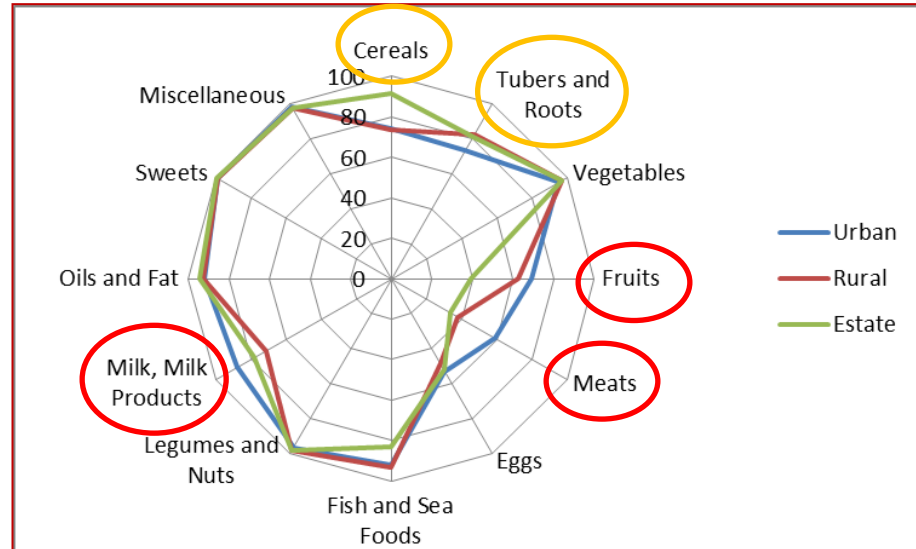


Figure 4: Consumption of different food groups across different economic sectors



Principal Component Analysis (PCA) findings



| Component | Eigenvalue | Difference | Proportion | Cumulative |
|---------------------------------|------------|------------|------------|------------|
| Comp1 | 2.72898 | 1.09017 | 0.4548 | 0.4548 |
| Comp2 | 1.63881 | .785309 | 0.2731 | 0.7280 |
| Comp3 | .853499 | .446405 | 0.1422 | 0.8702 |
| Paddy production (Mt) | .407094 | .206624 | 0.0678 | 0.9381 |
| Total vegetable production (Mt) | .0293187 | | 0.0334 | 0.9715 |
| Comp6 | .171152 | . | 0.0285 | 1.0000 |

Agricultural production Index = $(0.4548/0.7280) * pc1 + ((0.7280-0.4548)/0.7280) * pc2$

| Variables | HDDS | EI | SI |
|----------------------------------|------------------------|------------------------|------------------------|
| Market Access | 0.0829*** (0.0307) | 0.0538*** (0.0071) | 0.0247*** (0.0034) |
| Agricultural Production Index | -0.0362*** (0.0113) | 0.0101*** (0.0028) | 0.0063*** (0.0014) |
| Gender of household head | | | |
| Male (RC) | | | |
| Female | 0.4690*** (0.0379) | 0.0370*** (0.0082) | 0.0180*** (0.0039) |
| Age of household head | -0.0038*** (0.0009) | -0.0017*** (0.0002) | -0.0008*** (0.0001) |
| Marital status of household head | | | |
| Never married (RC) | | | |
| Married | 1.8400*** (0.1320) | 0.0970*** (0.0258) | 0.0525*** (0.0120) |
| Widowed | 1.3570*** (0.1330) | 0.0956*** (0.0263) | 0.0496*** (0.0123) |
| Divorced | 1.1670*** (0.2070) | 0.0387 (0.0412) | 0.0328* (0.0193) |
| Separated | 0.9630*** (0.1610) | 0.0379 (0.0313) | 0.0250* (0.0146) |





| | | | |
|--|--------------------------|----------------------------|---------------------------|
| Level of education of household head | | | |
| No school (RC) | | | |
| Primary | 0.3200*** (0.0726) | 0.0608*** (0.0161) | 0.0273*** (0.0079) |
| Secondary | 0.7000*** (0.0716) | 0.1050*** (0.0159) | 0.0410*** (0.0077) |
| Post-secondary | 1.0030*** (0.0770) | 0.1410*** (0.0173) | 0.0537*** (0.0084) |
| Tertiary | 0.9490*** (0.0996) | 0.1470*** (0.0223) | 0.0580*** (0.0106) |
| Household size | 0.0980*** (0.0102) | 0.0016 (0.0022) | 0.0013 (0.0010) |
| Household monthly income (LKR '0000) | 0.0122*** (0.0036) | 0.0006 (0.0006) | 0.0002 (0.0003) |
| Household monthly income^2 | -0.0001*** (4.39e-05) | -1.44e-05*** (5.32e-06) | -5.31e-06** (2.11e-06) |
| Household monthly food expenditure (LKR '0000) | 0.6310*** (0.0272) | 0.0995*** (0.0054) | 0.0340*** (0.0022) |
| Sector | | | |
| Urban (RC) | | | |
| Rural | 0.0859** (0.0347) | -0.0702*** (0.0079) | -0.0327*** (0.0037) |
| Estate | 0.1300** (0.0616) | -0.1000*** (0.0144) | -0.0435*** (0.0069) |
| Constant | 5.3940*** (0.1810) | 0.8610*** (0.0372) | 0.4630*** (0.0174) |
| Observation | | 21755 | |
| R-squared | 0.2460 | 0.0910 | 0.0560 |

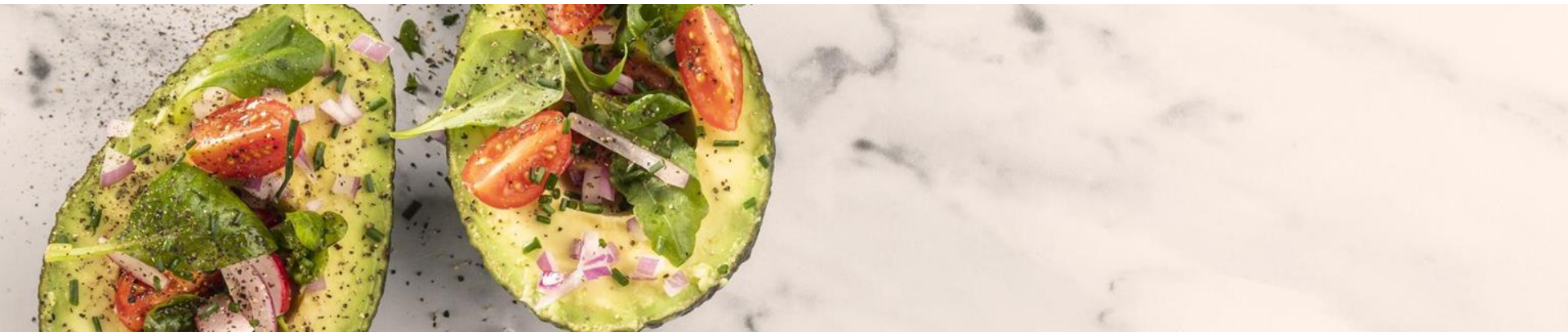




| Variable | VIF | 1/VIF |
|---|------|--------|
| Market Access | 1.15 | 0.8666 |
| Agricultural Production | 1.05 | 0.9539 |
| Gender of household head | 1.71 | 0.5832 |
| Age of household head | 1.27 | 0.7875 |
| Marital status of household head | | |
| Married | 8.60 | 0.1163 |
| Widowed | 7.63 | 0.1311 |
| Divorced | 1.29 | 0.7739 |
| Separated | 2.18 | 0.4588 |
| Level of education of household head | | |
| Primary | 5.96 | 0.1677 |
| Secondary | 8.00 | 0.1250 |
| Post-secondary | 4.76 | 0.2101 |
| Tertiary | 1.98 | 0.5042 |
| Household size | 1.44 | 0.6935 |
| Household monthly income (LKR '0000) | 2.93 | 0.3419 |
| Household monthly income ² | 2.42 | 0.4131 |
| Household monthly food expenditure (LKR'0000) | 1.65 | 0.6061 |
| Sector | | |
| Rural | 1.40 | 0.7135 |
| Estate | 1.37 | 0.7286 |
| Mean VIF | | 3.16 |



Conclusion and References





Conclusion

- The econometric exercise confirms that market access and residing in agricultural producing areas play a key role in enhancing dietary diversity in Sri Lanka.
- Households who have greater market access enjoyed diverse diets. In addition, residing in agricultural production areas also enables higher diet diversity.
- Urban and high-income households consume a greater amount of different food categories than their rural and low-income counterparts.
- Dietary diversity was significantly higher in households headed by women than men.
- Households headed by younger people also showed greater diversity in their diets.
- Education level and marital status also had a significant influence on improved dietary diversity.

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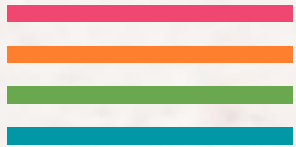
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Thank You!

