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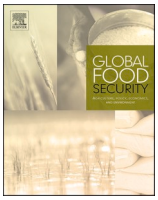

# The importance and determinants of purchases in rural food consumption in Africa: Implications for food security strategies

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ABSTRACT

We analyze rural households' purchases of food (cereals and non-cereals) in Sub-Saharan Africa using nationally representative data with 65,000 observations covering 7 countries over a decade. We distinguish between three strata of countries: lower stratum in income and urbanization, middle stratum, and upper stratum. The paper breaks ground by the breadth and time length of the sample. We find that purchases form the majority of rural food consumption whether in favorable or unfavorable agroecological zones and over country and income strata and for most food products. Rural nonfarm employment (as a cash source) plays an important role in household food purchases across all study countries and food products. Policy implications include the importance of food purchase markets and supply chains to and in rural areas as well as nonfarm employment.

## 1. Introduction

In this paper we present detailed evidence of the importance and determinants of purchases in food consumption of rural households in Sub-Saharan Africa (SSA). This adds to a debate about how, and from what sources, farm households get the food they consume; and adds to a literature, and a fragmented evidence base that has been growing in developing regions for decades. Our contribution is a systematic analysis of this phenomenon over heterogeneous rural areas in widely differing countries, agroclimatic zones, food product types, and over the span of more than a decade (see Table 1).

There has been a surge in interest in and importance of the topic of rural food purchases in SSA because of controversies in policy debates during COVID-19, with many taking a position that rural households are insulated from food price hikes because they rely little on purchases from food markets and can just grow their own food and wait out the crisis. This position harks back to a long-standing view of SSA rural households as autarchic, subsistence households. But recent evidence such as Maredia et al. (2022) showed for five SSA countries that COVID-19 effects on incomes and consumption were similar between urban and rural areas, suggesting that rural households depend on purchases from food markets.

There has been a parallel surge of interest in rural food purchases in the nutrition debate, such as Sibhatu and Qaim (2017, 2018) and Olabisi et al. (2021) showing that diet product diversity is not or only weakly correlated with crop diversity of rural households. This suggests that these households rely on purchases from markets.

The above two recent debates dovetail with a long-term debate in the development literature about whether, how much, and where purchases take place (Barrett et al., 2022). Here we briefly review the evolution of the literature on this theme and point to the gaps that we address.

A first strand of relevant literature was the farming systems literature in the 1960s and 1970s that emphasized the autarchic or subsistence character of the SSA rural households. It examined farmers' strategies to minimize cereal output variation, store and redistribute cereals, and supplement cereals with fruits and vegetables and animal products through home gardens, livestock holdings, and hunting and gathering (Eicher and Baker, 1982; Toulmin 1986).

A second strand of literature emerging in the 1970s and 1980s focused on the exceptions to autarchy when, for example, droughts strained a village or a household's farm production. Households then "cope" with the shock by buying grain (this literature focused on food-grains) either with cash from migrant earnings or sales of livestock or by doing farmwork for households who had grain stores and could pay for

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**Table 1**
Distribution of sample across the countries.

| | T | Years | Number of Households | Number of Observations |
|---|---|---|---|---|
| Ghana | | | | |
| Panel | 3 | 2011, 2015, 2019 | 2604 | 7812 |
| Nigeria | | | | |
| Panel | 3 | 2011, 2013, 2016 | 3114 | 9342 |
| Cross-section | 1 | 2019 | 3427 | 3427 |
| Tanzania | | | | |
| Panel A | 3 | 2009, 2011, 2013 | 1733 | 5199 |
| Panel B | 2 | 2015, 2020 | 532 | 1064 |
| Uganda | | | | |
| Panel A | 5 | 2005, 2010, 2011, 2012, 2014 | 1137 | 5685 |
| Panel B | 3 | 2016, 2019, 2020 | 2172 | 6516 |
| Ethiopia | | | | |
| Panel | 3 | 2012, 2014, 2016 | 3219 | 9657 |
| Cross-section | 1 | 2019 | 3115 | 3115 |
| Malawi | | | | |
| Panel | 4 | 2011, 2013, 2016, 2019 | 1491 | 5964 |
| Cross-section | 1 | 2019 | 2355 | 2355 |
| Niger | | | | |
| Panel | 2 | 2012, 2015 | 2189 | 4378 |

the work in-kind in the form of grain (e.g., in Mali, Toulmin, 1986; in the Gambia, Haswell, 1975; in Burkina Faso, Reardon et al., 1988).

A third strand of literature emerged in the 1970s and 1980s and intensified in the 1990s/2000s; we call it "development of structural purchasing." Rather than occasional purchases, structural changes in the rural household segment and the rural economy led to persistent purchasing. Three structural cases are noteworthy:

a) Broadening of cash cropping induces households to buy food. An example is Kennedy and Cogill (1988) showing sugarcane farmers bought food (and had better nutrition than subsistence farmers).
b) Persistent land poverty that causes rural households to be net food buyers. An early example of this is in research on pastoral households in SSA (Little et al., 2014 in the Horn of Africa). In Asia, Mellor (1976) contended that the Green Revolution would drive down rural food prices and help the rural poor because many small Indian farmers and landless are net buyers of food and thus food price increases hurt the rural poor and helped only the net seller minority. Weber et al. (1988), Barrett (2008), and Masters et al. (2013) underscored for Africa Mellor's India point. Part of the early African work literature contended that farmers undertake "forced sales" wherein they sold at low prices after the harvest and then ran out of food and had to purchase at high prices in the hungry season. This theme was revived in the 2000s and tested empirically (e.g., for Kenya, Stephens and Barrett, 2011; Renkow et al., 2004). We do not address this theme in the present paper.
c) The rise of rural non-farm employment (RNFE) provides cash for food purchases by African households (Toulmin 1986; Reardon et al., 1988, 1994). As RNFE has grown quickly in developing countries, including in SSA, to form nearly half of rural incomes, RNFE as a cash source for food purchases has been increasingly recognized in the literature on food purchases (Haggblade et al., 2010). Studies (e.g., Sauer et al. (2021) in Tanzania) have shown that RNFE drives rural purchases of processed foods as women undertaking RNFE seek to save time home-processing and preparing food.

The result of the above trends has been the rise of rural households' purchases of food in SSA. Various studies have documented that rise. Most of the studies have focused on individual countries and years; a number of these studies have shown that purchases have attained major shares of rural food consumption (such as Faye et al. (2023) for fruits and vegetables consumption).

However, there is a gap in the literature: there is a need for a more comprehensive analysis across years and countries and agroecological zones to reach a systematic and comparative understanding of rural food purchases in Africa. To address that gap, we test for the diffusion and persistence of food purchases associated with variables we hypothesize to affect purchases: (1) macro and meso variables such as the level of development of the country, the agroecological status of the zone (whether it is favorable or unfavorable for crop production) and the rainfall level (good and bad rainfall years); and (2) micro variables such as farm size, RNFE, and other cash sources. These hypotheses have not yet been tested across countries and across years. Our evidence covers seven countries that range from upper to medium to lower development-level country strata based on income and urbanization characteristics; the data span favorable and less-favorable agroclimatic zones; the data cover a wide set of food products; and our evidence documents change over a decade leading up to the present.

The paper proceeds as follows. Section 2 discusses data and definitions. Section 3 presents descriptive statistics. Section 4 presents the regression model and its results. Section 5 concludes with implications for food security policies and strategies.

## 2. Data and definitions

### 2.1. Data

We analyze nationally representative panel survey data from nearly 65,000 rural households from 7 countries in SSA: Ethiopia, Ghana, Malawi, Niger, Nigeria, Tanzania, and Uganda. The data are from the rural household sub-sample of the Living Standards Measurement Study-Integrated Surveys on Agriculture (LSMS-ISA), except for Ghana. These surveys were conducted by the country national statistical institutions in collaboration with the World Bank's LSMS team. For Ghana, we use the rural sub-sample of the Ghana Socioeconomic Panel Survey (GSPS), the only nationally representative panel survey for Ghana. For some of the Ghana analysis we complement the GSPS with data from the Ghana Living Standards Survey (GLSS), an LSMS-type nationally representative repeated cross-sectional household survey that has comparable samples covering a longer period (1992–2017) than the GSPS. The LSMS-ISA surveys have comparable sample designs and questionnaires, albeit with some variations across countries. As much as possible our key variables are constructed from similar, and in most cases identical, questions across the countries.

The surveys span various years but are mostly between 2010 and 2020 (Table A1, appendix). They have a two-stage sampling design where enumeration areas or clusters were drawn at the first stage for each stratum. Within each cluster, a listing of households was done to construct a sample frame from which a random sample of households was drawn. Because the samples are not self-weighting, we use sampling

**Table 2**
Mean characteristics of the pooled rural sample.

| Variables | Overall | Upper | Middle | Lower | Ghana (2010–19) | Nigeria (2011–19) | Tanzania (2011–20) | Uganda (2011–20) | Ethiopia (2012–19 | Malawi (2011–19) | Niger (2012,15) |
|---|---|---|---|---|---|---|---|---|---|---|---|
| GDP pc, PPP (current Int. $)[a] | 2839 | 5291 | 2414 | 1825 | 5307 | 5274 | 2652 | 2176 | 2164 | 1075 | 1223 |
| Share of rural population (%) | 70 | 49 | 73 | 83 | 46 | 52 | 68 | 78 | 81 | 84 | 84 |
| Food consumption shares | | | | | | | | | | | |
| Purchased share of all foods | 58 | 72 | 51 | 44 | 68 | 72 | 55 | 51 | 39 | 48 | 70 |
| Purchased share of cereals | 51 | 68 | 55 | 29 | 68 | 68 | 50 | 56 | 25 | 37 | 56 |
| Purchased share of roots & tubers | 51 | 58 | 27 | 56 | 52 | 58 | 37 | 26 | 54 | 60 | 96 |
| Purchased share of pulses | 61 | 75 | 45 | 53 | 70 | 76 | 51 | 44 | 51 | 45 | 71 |
| Purchased share of edible oils | 79 | 88 | 96 | 60 | 79 | 89 | 96 | 96 | 40 | 97 | 97 |
| Purchased share of fruits & veg | 74 | 78 | 54 | 79 | 76 | 78 | 57 | 53 | 90 | 62 | 83 |
| Purchased share of animal proteins | 72 | 87 | 77 | 52 | 82 | 88 | 74 | 77 | 32 | 80 | 78 |
| Income shares | | | | | | | | | | | |
| Farm share of total income (%) | 53 | 39 | 46 | 73 | 53 | 38 | 53 | 46 | 79 | 45 | 78 |
| Non-farm share of total income (%) | 43 | 58 | 46 | 23 | 36 | 60 | 42 | 46 | 17 | 49 | 19 |
| Remittance share of total income (%) | 5 | 3 | 8 | 4 | 11 | 2 | 4 | 8 | 4 | 5 | 4 |
| Cash share of total income (%) | 68 | 81 | 65 | 53 | 76 | 81 | 68 | 64 | 53 | 63 | 24 |
| Farm share of cash income (%) | 41 | 31 | 31 | 58 | 43 | 30 | 39 | 31 | 69 | 23 | 16 |
| Non-farm share of cash income (%) | 53 | 65 | 58 | 36 | 44 | 67 | 54 | 59 | 26 | 70 | 71 |
| Remittance share of cash income (%) | 6 | 4 | 11 | 6 | 13 | 3 | 8 | 11 | 5 | 7 | 13 |
| Assets | | | | | | | | | | | |
| Farmland (ha) | 1.3 | 0.9 | 0.9 | 2.0 | 2.1 | 0.8 | 1.6 | 0.8 | 1.2 | 1.6 | 12.4 |
| Farmland pc (ha) | 0.3 | 0.2 | 0.2 | 0.4 | 0.7 | 0.2 | 0.3 | 0.2 | 0.3 | 0.4 | 2.0 |
| Livestock wealth (cow equivalent) | 3.5 | 2.9 | 2.0 | 4.9 | 2.0 | 3.0 | 4.4 | 1.5 | 5.9 | 0.9 | 3.0 |
| Market access | | | | | | | | | | | |
| Distance to market (km) | 31.0 | 8.4 | 28.5 | 59.8 | 8.4 | 8.4 | 13.0 | 31.1 | 67.7 | 32.4 | 35.4 |
| Crop commercialization index (%) | 32 | 33 | 37 | 29 | 22 | 26 | 30 | 34 | 32 | 16 | 3 |
| Demographics | | | | | | | | | | | |
| Female headed household (%) | 22 | 18 | 32 | 21 | 34 | 16 | 26 | 32 | 21 | 28 | 11 |
| Age of household head | 48.6 | 51.3 | 48.1 | 45.6 | 51.3 | 51.3 | 47.9 | 47.8 | 46.0 | 43.7 | 45.8 |
| Household size | 5.6 | 5.8 | 6.0 | 5.2 | 3.8 | 6.1 | 5.2 | 6.1 | 5.2 | 5.0 | 6.7 |
| Number of female adults | 1.4 | 1.5 | 1.4 | 1.4 | 1.1 | 1.5 | 1.4 | 1.4 | 1.4 | 1.3 | 1.5 |
| Number of male adults | 1.3 | 1.3 | 1.3 | 1.3 | 0.9 | 1.4 | 1.3 | 1.4 | 1.3 | 1.2 | 1.3 |
| Dependency ratio (%) | 107 | 100 | 112 | 112 | 85 | 102 | 105 | 113 | 109 | 109 | 150 |
| Head is literate (%) | 55 | 57 | 70 | 45 | 47 | 58 | 74 | 69 | 42 | 66 | 28 |
| Adult literacy rate (%) | 54 | 53 | 76 | 43 | 41 | 54 | 79 | 74 | 40 | 66 | 16 |

Note.
The purchased shares are all in value terms.
[a] GDP per capita is retrieved from World Bank (2021) and is averaged over the last three most recent years for which data is available (i.e., 2017–2019).

weights provided in the datasets to account for the complex survey design. This generates nationally representative statistics from the samples. The sample weight for each household is calculated as the inverse of the probability of being drawn from the frame given the sampling design.

Most of the panel surveys ran for three waves and then introduced 'refresh' samples, and in some cases only a small sub-sample of the original panel was maintained. To ensure the integrity of the panel and have sufficient statistical power for our empirical analysis, we utilize the available data in various ways. For each country, we construct the longest possible panel but with sufficient observations to be representative of the rural population. For some countries, we do the analysis using more than one sample – one with a relatively short panel but with higher statistical power, and then another with a longer panel but fewer observations per wave. In some cases, we also utilize the latest cross-section where there is a new baseline to get more information. Table 1 provides a summary of the rural sample used for each country. To understand changes occurring for the same households over time, we use only the balanced samples for the panel data regression analyses, mostly dropping observations that appear in only one wave. Panel attrition rates across the samples range between about 2% for Ethiopia and 9% for Ghana.

**Table 3**
Mean purchased share of food consumed by rural households in value terms.

| Country/year | All foods consumed | Cereal grains | Roots & tubers | Legumes/Pulses | Edible oils | Fruits & vegetables | Animal proteins |
|---|---|---|---|---|---|---|---|
| Ghana | | | | | | | |
| 2010 | 69 | 64 | 52 | 78 | 77 | 81 | 81 |
| 2014 | 65 | 69 | 50 | 66 | 76 | 74 | 79 |
| 2019 | 69 | 70 | 54 | 66 | 82 | 74 | 84 |
| Nigeria | | | | | | | |
| 2011 | 74 | 69 | 62 | 80 | 91 | 84 | 92 |
| 2013 | 69 | 65 | 58 | 75 | 87 | 76 | 88 |
| 2016 | 72 | 67 | 59 | 75 | 89 | 78 | 89 |
| 2019 | 74 | 69 | 54 | 72 | 88 | 74 | 82 |
| Tanzania | | | | | | | |
| 2011 | 51 | 45 | 35 | 47 | 95 | 54 | 67 |
| 2013 | 54 | 51 | 34 | 46 | 93 | 51 | 71 |
| 2015 | 60 | 51 | 42 | 54 | 98 | 60 | 77 |
| 2020 | 55 | 51 | 36 | 55 | 97 | 61 | 78 |
| Uganda | | | | | | | |
| 2011 | 49 | 52 | 25 | 39 | 96 | 56 | 77 |
| 2014 | 49 | 53 | 23 | 40 | 97 | 50 | 76 |
| 2016 | 45 | 54 | 18 | 38 | 95 | 47 | 76 |
| 2020 | 55 | 64 | 34 | 56 | 94 | 53 | 79 |
| Ethiopia | | | | | | | |
| 2012 | 33 | 20 | 52 | 46 | 29 | 88 | 36 |
| 2014 | 41 | 23 | 53 | 53 | 35 | 92 | 30 |
| 2016 | 40 | 23 | 58 | 54 | 39 | 90 | 32 |
| 2019 | 43 | 32 | 54 | 50 | 57 | 89 | 30 |
| Malawi | | | | | | | |
| 2011 | 44 | 28 | 48 | 39 | 98 | 56 | 76 |
| 2013 | 33 | 30 | 61 | 48 | 98 | 64 | 78 |
| 2016 | 56 | 45 | 71 | 44 | 94 | 63 | 85 |
| 2019 | 58 | 44 | 60 | 49 | 97 | 65 | 81 |
| Niger | | | | | | | |
| 2012 | 73 | 61 | 95 | 71 | 95 | 88 | 75 |
| 2015 | 68 | 52 | 96 | 71 | 98 | 78 | 82 |

Notes: Authors' computations using the datasets described.

### 2.2. Definitions of key variables and strata

#### 2.2.1. Purchases' shares in food consumption

A key variable in our analysis is shares of purchases in food consumption, for food overall and for various product categories. This share is food consumed (overall or of product *i*) that is purchased, divided by the value of total food consumed. The latter is the sum of food consumed from purchases, own-production, and food gifts and payments received in-kind. We calculate that share over food groups including: (1) cereals; (2) roots & tubers; (3) pulses; (4) edible oils; (5) fruits and vegetables; and (6) animal proteins.

Over the period of the panels, some food items were added to the list in some countries. However, in all countries except Ethiopia, about 98% of the food items were consistently covered over the period of the panels. For all countries, we use the list of food items for which we have data over the entire period of the panels.

We valued all foods consumed that were not purchased at the cluster or community median price if there were sufficient observations at that level. Otherwise, we use the median price at the next level of aggregation such as the ward or local government area, depending on the country.

#### 2.2.2. Income sources by sector and by cash versus in-kind

In the regressions, we will show the correlations between the share of purchases in consumption and various income sources. We define the latter here. There are two functional categories of income: (1) cash income, from both earned income (from agricultural sales, self-employment in rural non-farm income (RNFI) enterprises, and wage and salary employment) and unearned income (most of which is remittances); (2) in-kind income, formed by addition of the imputed value of in-kind income received as gifts and in-kind payments (either self-valued or imputed using cluster median prices) and the imputed value of own-produced agricultural production less the costs of own agricultural production. There are two sectoral sources of income: (1) farm income (income from crops and livestock); (2) RNFI (all other income, cash or in-kind, earned though the supply of household labor to manufactures or services undertaken in rural areas including in rural towns).

While remittances can in theory be in cash or in-kind (such as a sack of grain sent from the city to the rural household) and can be from the farm or non-farm sector, most of the remittances are in cash and from household members undertaking non-farm activity in cities, although some are in other farm areas. We count remittances as unearned income; we lump with them pensions which are a minor source of transfers: on average across all the countries, migrant remittances make up 85% of this source of income (98–100% for Ghana, Tanzania, Uganda, and Niger).

#### 2.2.3. Lower, middle, and upper country strata ranked by development indices

We expect purchases of food by rural households to be correlated positively with the GDP per capita of a country and negatively with the share of rural population in total population. In turn, GDP/capita is positively and the rural share of population is negatively correlated with overall economic development and transformation (Timmer, 1988).

Table 2 shows the study countries' GDP per capita in current USD purchasing power parity (PPP) terms as an average of the three most recently available years from the World Bank (https://data.worldbank.org/indicator), 2019–2021. The table also shows the share of the rural population in total population in 2021 from the same source.

The countries roughly divide into three sets which we will call upper, middle, and lower country strata based on the above indicators. Upper includes Ghana and Nigeria, with an average GDP/capita of 5488 USD and rural population share of 49%; middle includes Tanzania and Uganda, with GDP/capita of 2564 USD and rural share of 69%; lower includes Ethiopia, Malawi, and Niger, with a GDP/capita of 1760 USD

**Table 4**
Mean shares of cash and total income among rural households.

| | Shares of cash income (%) | | | Shares of total income (%) | | |
|---|---|---|---|---|---|---|
| Country/ year | Farm | Non-farm | Transfers | Farm | Non-farm | Transfers |
| All countries | 41 | 53 | 6 | 53 | 43 | 4 |
| Country strata | | | | | | |
| Upper | 31 | 65 | 4 | 39 | 57 | 3 |
| Middle | 31 | 58 | 11 | 46 | 46 | 8 |
| Lower | 58 | 36 | 6 | 73 | 23 | 4 |
| Ghana | | | | | | |
| Overall | 43 | 44 | 13 | 52 | 36 | 11 |
| 2010 | 46 | 45 | 9 | 54 | 38 | 8 |
| 2014 | 42 | 45 | 13 | 55 | 34 | 11 |
| 2019 | 41 | 44 | 15 | 49 | 37 | 14 |
| Nigeria | | | | | | |
| Overall | 30 | 67 | 3 | 38 | 60 | 2 |
| 2011 | 25 | 74 | 1 | 34 | 65 | 1 |
| 2013 | 22 | 77 | 1 | 30 | 69 | 1 |
| 2016 | 41 | 58 | 1 | 46 | 53 | 1 |
| 2019 | 33 | 58 | 9 | 42 | 50 | 8 |
| Tanzania | | | | | | |
| Overall | 32 | 53 | 14 | 48 | 45 | 8 |
| 2011 | 49 | 50 | 1 | 64 | 35 | 1 |
| 2013 | 41 | 52 | 7 | 56 | 39 | 5 |
| 2015 | 34 | 57 | 9 | 49 | 47 | 4 |
| 2020 | 32 | 53 | 15 | 47 | 45 | 8 |
| Uganda | | | | | | |
| Overall | 31 | 59 | 11 | 46 | 46 | 8 |
| 2011 | 21 | 72 | 7 | 35 | 59 | 6 |
| 2014 | 38 | 52 | 10 | 51 | 41 | 8 |
| 2016 | 24 | 63 | 13 | 51 | 42 | 7 |
| 2020 | 35 | 52 | 13 | 46 | 44 | 10 |
| Ethiopia | | | | | | |
| Overall | 69 | 26 | 5 | 79 | 17 | 4 |
| 2012 | 68 | 26 | 6 | 81 | 15 | 4 |
| 2014 | 69 | 26 | 5 | 78 | 18 | 4 |
| 2016 | 74 | 21 | 5 | 82 | 15 | 3 |
| 2019 | 64 | 31 | 5 | 75 | 20 | 5 |
| Malawi | | | | | | |
| Overall | 23 | 70 | 7 | 45 | 49 | 5 |
| 2011 | 32 | 64 | 4 | 59 | 38 | 3 |
| 2013 | 27 | 64 | 9 | 51 | 43 | 6 |
| 2016 | 18 | 74 | 8 | 39 | 54 | 7 |
| 2019 | 14 | 77 | 9 | 31 | 62 | 7 |
| Niger | | | | | | |
| Overall | 16 | 71 | 13 | 78 | 19 | 4 |
| 2012 | 9 | 85 | 6 | 71 | 27 | 2 |
| 2015 | 24 | 57 | 19 | 85 | 10 | 5 |

and a rural share of 81%.

#### 2.2.4. Favorable versus unfavorable agroecological zones

For each country, we grouped households into those living in favorable and unfavorable (or less-favorable) production zones based on rainfall distribution. The favorable zones tend to have bimodal rainfall distributions (and thus weak seasonality). The less-favorable zones have unimodal rainfall distributions (and thus sharp seasonality). Just due to the geography of the selected countries, in many countries the favorable zone was southern and the less favorable more Northern.

## 3. Description of households' purchase behavior, cash income, and other characteristics

Food constitutes the largest share of rural African households' total consumption, accounting for more than 60% of the household's budget in 6 out of the 7 countries, on average, over the survey periods (Figures A1-A3, appendix). Consistent with Engel's Law, Figure A4 shows that, in general, the poor spend a higher share of their income on food. Also, we observe in all countries a pattern consistent with Bennett's Law which states that as household income rises, the share of the food budget devoted to grains falls (Figure A5, appendix) while fruits and vegetables and animal proteins' shares of the food budget rise (Figures A6 and A7, appendix).

The rest of this section focuses on patterns in food purchases of sample households, and cash incomes and other characteristics of households that can help to understand how households fund and why they make food purchases. This is further explored with regressions in Section 4.

### 3.1. Food total and food categories purchase shares in rural areas of the three strata of countries

#### 3.1.1. Overview of purchase patterns over products and country strata

Table 2 shows sample households' shares of purchases in rural food consumption overall and by food product category. The following points stand out.

First, on average over the 7 countries the majority (58%) of all food consumed is purchased; the share is more than 50% in 5 out of the 7 countries. As expected, the shares differ (statistically significantly) over the country strata, increasing with income and decreasing with rurality, with 44% in the lower stratum (Ethiopia, Malawi, Niger), 51% in the middle (Tanzania and Uganda), and 72% in the upper (Ghana and Nigeria). Niger is the exception in the lower stratum, with a share of 70%, probably because its unfavorable farming conditions push rural households to buy food.

Second, over the 7 countries, there are substantial shares of purchases in consumption of basic staples (cereals, 51%, pulses, 61%, and roots/tubers, 51%). These findings are at odds with a long tradition in the African debate of the assumption that farmers grow their own staples and rely little on food markets; this point of view was much in evidence in the African policy debate during the years of COVID-19 such as in Nigeria (Liverpool-Tasie et al., 2021). The results are similar over most of the countries, with two sets of exceptions: Ethiopia and Malawi where the shares of purchases in cereals dip to a quarter and a third (with the other countries being above a half), and Uganda and Tanzania where the share of purchases of roots and tubers dip to a third and a quarter. The cereals exceptions can be explained by the high incidence of remote poor grain farms in those countries. The roots and tubers exceptions can be explained by these products being bulky and costly to transport and their being often grown and consumed mainly in remote mountainous areas (such as in Northwest Tanzania).

Third, a large majority of non-staple products are purchased, and this is consistent across all country strata: the purchase shares are over 70% for edible oils (79%), fruits and vegetables (74%), and animal products (72%). The purchase shares of edible oils are very high across all 7 countries because it is common for the import share of these oils to be high. More surprising is that the share of purchases in rural consumption of fruits and vegetables is around three quarters in both high and low strata countries; even in the middle stratum, more than half is purchased. This flies in the face of the common image of rural households growing their own vegetables in home gardens for sauce and backyard mangoes for seasonal treats. These findings corroborate country-specific findings such as Faye et al. (2023) who show for rural Senegal that 76% of fruit and vegetable consumption is purchased.. These purchases are supplied by relatively long supply chains from a few commercial horticulture zones to penetrate all around the Senegal, in rural and urban areas.

Also surprising is the high share of animal proteins purchased in high and medium strata countries, 87 and 77% respectively. The share is somewhat lower in low strata countries, 52%, but this masks the fact that Malawi and Niger have shares of 80% and 78%, like the upper strata countries, while Ethiopia's purchase share is only one third. This latter low share of purchases may be due to the importance of milk in Ethiopian hinterland rural diets and farmers often having their own milk cows mainly for subsistence (Minten et al., 2020).

**Table 5**
Mean purchased share (in value terms) of food consumed by rural households across agro-ecology and season.

| | Favorable zone | | | Less-favorable zone | | |
|---|---|---|---|---|---|---|
| Country/year | Harvest season | Lean season | Difference | Harvest season | Lean season | Difference |
| Ghana | | | | | | |
| Overall | 68 | 72 | 4 | 58 | 71 | 13 |
| 2010 | 71 | 74 | 3 | 51 | 66 | 15 |
| 2014 | 67 | 67 | 0 | 57 | 64 | 7 |
| 2019 | 68 | 72 | 4 | 63 | 79 | 16 |
| Nigeria | | | | | | |
| Overall | 73 | 76 | 3 | 67 | 75 | 8 |
| 2011 | 75 | 76 | 1 | 66 | 77 | 11 |
| 2013 | 72 | 74 | 2 | 63 | 69 | 6 |
| 2016 | 73 | 78 | 5 | 67 | 72 | 5 |
| 2019 | 72 | 74 | 2 | 72 | 77 | 5 |
| Tanzania | | | | | | |
| Overall | 52 | 58 | 6 | 52 | 64 | 12 |
| 2011 | 51 | 53 | 2 | 48 | 57 | 9 |
| 2013 | 50 | 61 | 11 | 47 | 62 | 15 |
| 2015 | 57 | 63 | 6 | 55 | 66 | 11 |
| 2020 | 50 | 56 | 6 | 55 | 71 | 16 |
| Uganda | | | | | | |
| Overall | 47 | 50 | 3 | 48 | 55 | 7 |
| 2011 | 46 | 48 | 2 | 51 | 60 | 9 |
| 2014 | 47 | 52 | 5 | 39 | 52 | 13 |
| 2016 | 41 | 46 | 5 | 44 | 52 | 8 |
| 2020 | 53 | 55 | 2 | 56 | 57 | 1 |
| Ethiopia | | | | | | |
| Overall | 36 | 44 | 8 | 44 | 61 | 17 |
| 2012 | 32 | 40 | 8 | 34 | 46 | 12 |
| 2014 | 39 | 41 | 2 | 43 | 64 | 21 |
| 2016 | 37 | 44 | 7 | 45 | 59 | 14 |
| 2019 | 35 | 45 | 10 | 51 | 66 | 15 |
| Malawi | | | | | | |
| Overall | 44 | 63 | 19 | 46 | 57 | 11 |
| 2011 | 46 | 54 | 8 | 41 | 47 | 6 |
| 2013 | 33 | 37 | 4 | 34 | 36 | 2 |
| 2016 | 49 | 68 | 19 | 53 | 67 | 14 |
| 2019 | 52 | 67 | 15 | 58 | 76 | 18 |
| Niger | | | | | | |
| Overall | 67 | 73 | 6 | 73 | 81 | 8 |
| 2012 | 70 | 74 | 4 | 77 | 79 | 2 |
| 2015 | 64 | 72 | 8 | 70 | 87 | 17 |

*3.1.2. Changes in purchase shares over a decade by product and zone type*

Table 3 shows shares of purchases in food consumption of rural households by country and over time by product group. The following points stand out.

First, for overall food, for the upper stratum countries, there was little change in the purchase share over the decade of the 2010s. For the middle stratum, the share increased by about 10%. For the lower stratum countries by contrast there was a sharp rise: 30% for Ethiopia (from 33 to 43%), and for Malawi, also 30% (44–58%). The findings suggest that the upper stratum is already at stability or "maturity" of about three-quarters of food being purchased; in the middle, Tanzania and Uganda are gradually rising toward that share at a modest convergence rate. By contrast, Ethiopian and Malawian rural areas are rushing toward convergence with the middle. This pattern of advanced countries in stasis, middle in gradual climb, and lagging areas in rapid change, mirrors a common pattern of "convergence" such as described for the industrial revolution by Gerschenkron (1962). The rate of transformation of food consumption habits in Ethiopia and Malawi is remarkable, showing how malleable food habits are and how change can sweep a countryside only recently thought highly traditional.

Second, in the lower stratum countries the jump in the purchase share of cereals consumption in the 2010s was two times faster than for overall foods (in Ethiopia, 20–32%, and Malawi, 28–44%). This shift from "self-reliance" for grain consumption contradicts the traditional image because it is often thought that while some households might buy what may be considered as luxuries beyond basic grains, they depend only on their own grains (and tend not to sell their grain) due to what was long held as a missing or constrained rural market for foodgrains for African rural areas (Liverpool-Tasie et al., 2021).

The share of purchases in cereals stayed below that in overall food, but even in the poorest countries the data show that is changing quickly: the share of purchases in cereals at the end of the decade is close to the share of purchases in overall food at the start of the 2010s. In the upper and middle strata countries, the shares of purchases in grain consumption rose at about the same rate as in overall food and the shares do not differ much from those for overall food, implying that for all but Ethiopia and Malawi, the shift to purchasing cereals happened before the 2010s – perhaps well before but we do not have the data to explore that.

Third, in all countries but Ethiopia the great majority of edible oils were purchased. The Ethiopia case is striking: in just a decade the share of purchases of edible oils leapt from 29 to 57%.

Fourth, there is a moderate (7–10%) decline in the purchase share of fruits and vegetables in food consumption in the upper stratum countries, dropping down to three quarters purchased. In the middle stratum, the shares in Tanzania and Malawi rose 7%, while Ethiopia's stayed stable at 90%, higher than other countries.

Fifth, the share of purchases in consumption of animal proteins shifted a bit in most countries but stayed high. It dropped 10% (but still to a high 82%) in Nigeria and rose slight in Ghana from 81% to 84%. Tanzania's rose 11%–78% to converge with Uganda's 79% and Malawi's 81%. The outlier was Ethiopia, both much lower overall, and with a decline from 36% to only 30%. This may be because Ethiopian rural households' own production of livestock is nearly double the average

**Table 6**
Mean purchased share (in value terms) of food consumed by rural households across wealth indicators.

| Country/ year | Farmland per capita | | Commercialization rate | | Non-farm income share | |
|---|---|---|---|---|---|---|
| | < average | ≥ average | < average | ≥ average | < average | ≥ average |
| Ghana | | | | | | |
| Overall | 70 | 62 | 71 | 62 | 60 | 76 |
| 2010 | 71 | 64 | 72 | 65 | 62 | 77 |
| 2014 | 67 | 59 | 68 | 60 | 57 | 75 |
| 2019 | 71 | 62 | 72 | 62 | 61 | 77 |
| Nigeria | | | | | | |
| Overall | 75 | 65 | 75 | 70 | 63 | 78 |
| 2011 | 76 | 66 | 75 | 72 | 62 | 80 |
| 2013 | 72 | 60 | 72 | 65 | 58 | 75 |
| 2016 | 75 | 65 | 76 | 69 | 64 | 79 |
| 2019 | 75 | 70 | 75 | 72 | 66 | 79 |
| Tanzania | | | | | | |
| Overall | 58 | 49 | 58 | 51 | 45 | 68 |
| 2011 | 53 | 47 | 54 | 48 | 43 | 65 |
| 2013 | 57 | 47 | 58 | 49 | 43 | 69 |
| 2015 | 62 | 54 | 64 | 54 | 49 | 71 |
| 2020 | 58 | 48 | 57 | 53 | 45 | 66 |
| Uganda | | | | | | |
| Overall | 52 | 45 | 54 | 45 | 38 | 61 |
| 2011 | 51 | 45 | 53 | 44 | 35 | 61 |
| 2014 | 52 | 43 | 52 | 45 | 39 | 61 |
| 2016 | 46 | 43 | 50 | 42 | 36 | 55 |
| 2020 | 58 | 47 | 60 | 47 | 43 | 67 |
| Ethiopia | | | | | | |
| Overall | 45 | 32 | 43 | 36 | 34 | 54 |
| 2012 | 37 | 28 | 34 | 33 | 29 | 48 |
| 2014 | 46 | 34 | 42 | 39 | 36 | 53 |
| 2016 | 46 | 32 | 45 | 36 | 36 | 52 |
| 2019 | 49 | 35 | 50 | 34 | 36 | 61 |
| Malawi | | | | | | |
| Overall | 50 | 44 | 47 | 49 | 37 | 59 |
| 2011 | 45 | 42 | 44 | 43 | 34 | 57 |
| 2013 | 35 | 30 | 34 | 33 | 28 | 40 |
| 2016 | 59 | 51 | 55 | 59 | 43 | 69 |
| 2019 | 61 | 53 | 56 | 61 | 44 | 68 |
| Niger | | | | | | |
| Overall | 72 | 67 | 69 | 88 | 66 | 87 |
| 2012 | 74 | 69 | 71 | 88 | 68 | 88 |
| 2015 | 69 | 65 | 67 | 88 | 64 | 85 |

across study countries; this reinforces the image of the rural hinterland "pocket" being more substantial in Ethiopia than the other countries.

Table 5 shows shares of purchases in food consumption of rural households by country and over time by favorable versus less-favorable zone, and per zone, by harvest versus lean season. The following points stand out.

First, for the upper and middle strata countries: (1) there is not much seasonality in the purchase share, with the less-favorable zone having just a slightly larger increase in purchase shares between the harvest and lean seasons; (2) controlling for the season, there is not much difference in purchase shares between favorable and less-favorable zones.

Second, by contrast, in the lower stratum countries even in the favorable zones the lean season has higher shares of purchases than in the harvest season. In the final survey year, in Ethiopia's favorable zone, the lean season's purchase share is 10% higher than in the harvest season, and in the less-favorable zone, 15%. The pattern is similar in Malawi.

### 3.2. *Overview of characteristics of the rural households in the seven-country sample*

Table 2 shows salient characteristics of the households that have probable influences on the shares of food purchases of the households. The patterns are used to form hypotheses that are tested in the regression section. Note that household assets and demographic characteristics are discussed in the Appendix.

#### 3.2.1. *Income sources of rural households*

First, on average across the countries, 53% of total household income comes from own-farming. The share varies sharply and inversely with the country stratum: with a low in Nigeria (38%), highs in Ethiopia (79%) and Niger (78%), and near the average in the other countries. As unearned income is minor (around 5% on average across all countries), most of the non-own-cropping income is RNFI. RNFI averages 43% of rural household income across all countries and is higher (58%) in the upper stratum countries and lower in the other two strata (around 40%). This is similar to findings in Haggblade et al. (2010) from diverse household data in Africa. Ghana is an outlier with an RNFI of only 36% and an own-farm income share of 53%; this is because there is a lot of cash cropping in Ghana. The low own-farm income shares and high RNFI share in Nigeria may be due to a high urbanization rate and many small and medium towns creating linkages to rural areas. While urbanization rates are also high in Ghana, the link to the rural economy is seen more though the higher share of income (11%) from migrant remittances, which when added to RNFI raises the non-own-cropping share to 47%.[1]

Moreover, cash income in total income (with the complement being the imputed value of own-farm production that is home consumed, i.e., not sold) is on average 68% of total income across all countries: SSA rural households are highly "monetized" in all three country strata.

RNFI is the most important component of cash income – its share in total cash income averages 53% over all countries. Among the upper stratum, RNFI's share is lower in Ghana (44%) than in Nigeria (67%), again because cash cropping is particularly important in Ghana.[2] In the other countries the RNFI share of cash share is 60–70%, except for Ethiopia with only 26%.

#### 3.2.2. *Cash income in total income by favorable versus less-favorable zones*

Figs. 1–3 show shares of cash income in total income by zone type. Overall, in all three strata of countries (with Mali being an outlier) rural household income is mainly composed of cash in both favorable and less-favorable agroecological zones. In all but Ethiopia and Niger the share of cash in total income was relatively close between the two zone types. The following specific points stand out.

First, in upper stratum countries, the cash share in favorable zones exceeds that of less-favorable zones by only 11% for Ghana and 6% for Nigeria. The shares were relatively stable over the decade except for the less-favorable zone in Ghana where the share rose from 57 to 78% probably due to road improvement in northern Ghana that helped the zone integrate more into the national cash economy. The modest difference between favorable and less favorable zones can be attributed to pull factors (like agriculturally linked RNFE in the favorable zones) balancing the push factors (like the need to compensate for a poor resource base in the less-favorable zone).

Second, in middle and lower strata countries (except for Uganda and Malawi where the difference is not significant statistically), the cash share is higher for the less-favorable zone than the favorable zone by 11% in Tanzania and Ethiopia and 28% in Mali. We surmise that these results differ from those of the upper stratum because push factors in the less-favored zone (such as rainfall risk) are stronger in the middle and lower strata countries and drive households to undertake more coping and risk management via undertaking RNFE to compensate.

In some countries the cash share climbed quickly, such as in the less-favored zone in Tanzania where the share climbed from 62 to 76% over the decade; in Malawi and Ethiopia the share jumped from 55% to 71%

[1] Note that the Ghana LSMS data shows higher non-farm shares of income, increasing from about 52% in 1992 to 60% in 2017 (Figure A1 Appendix), similar to Nigeria's.

[2] Note that in the Ghana LSMS the share is 61%, on average, for the surveys in the 2010s (Figure A1).

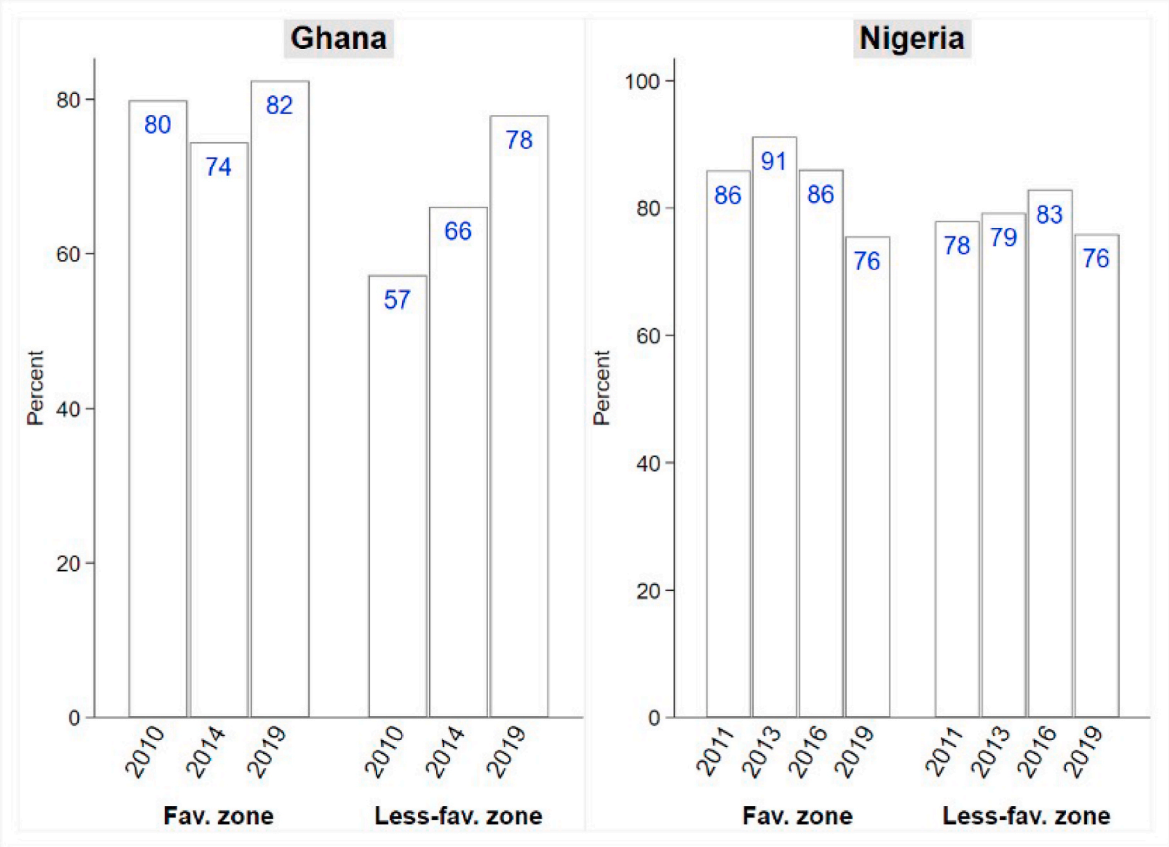


**Fig. 1.** Mean cash shares of total income in upper stratum countries.

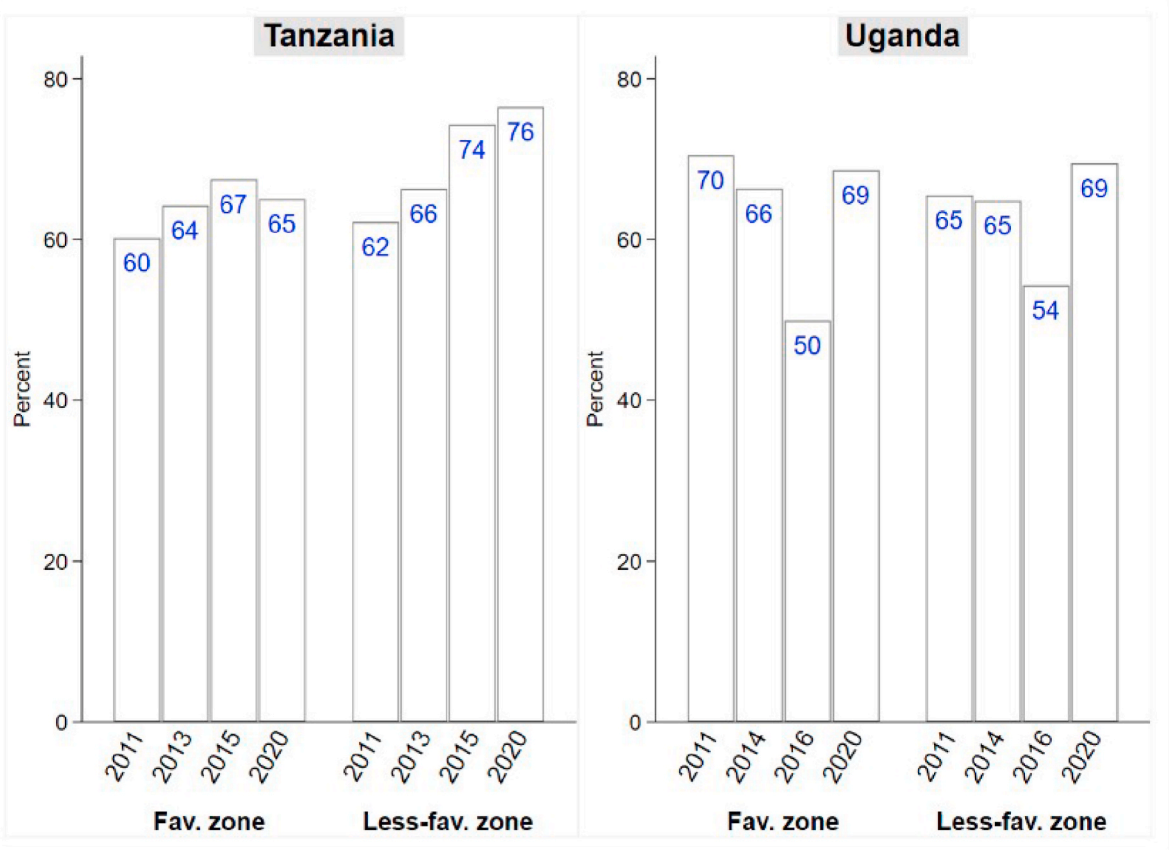


**Fig. 2.** Mean cash shares of total income in middle stratum countries.

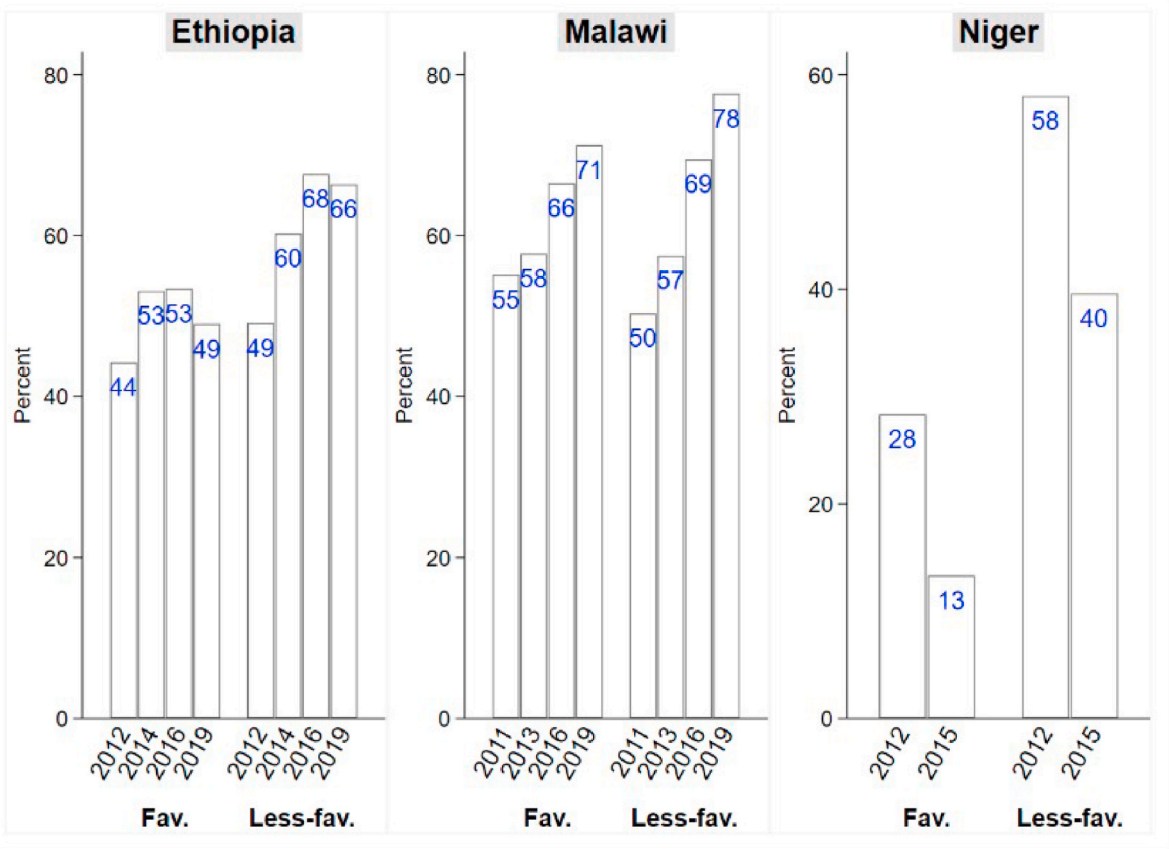


**Fig. 3.** Mean cash shares of total income in lower stratum countries.

in the favorable and from 50% to 78% in the less-favorable zone. Ethiopia showed a more "expected" pattern, with the cash share 20% higher in the less-favorable zone (presumably because of "push factors"). But even in the less-favorable zone in Ethiopia, there was a jump in the cash share of about 34% in the less-favorable zone.

### 3.2.3. *Sectoral shares in cash incomes of households*

Table 4 shows shares of farm, RNFE, and unearned income in total cash income and total income (cash income plus the imputed value of own-farming output in gross terms).

First, farm output sales only constitute 31% of household cash among the upper and middle strata countries, averaging over the decade (with Ghana's higher than the average at 43% and the rest around 30%). But this share changed over the years of the decade. Middle stratum countries saw a rapid decline in Tanzania (from 49 to 32%) and a rapid rise in Uganda (from 21 to 35%).

By contrast, farm output sales form 58% of rural cash incomes in lower stratum countries. But this high share was driven mainly by Ethiopia which averaged 69% over the period, steady over years; Malawi's cash crop share in rural incomes was only 23% (and dropping fast from 32 to 14% over the years. Niger's bounced from 9% in 2012 to 24% in 2015, a situation that driven by poor rainfall in 2011 relative to 2014.

Second, the great majority of cash outside farm sales is from RNFE in upper and middle strata countries where RNFE forms 65% and 58% of cash, respectively (averaged over years). The RNFE share of cash is also high in the lower income countries of Malawi and Niger (averaging 70 and 71%) but less than a third (26%) in Ethiopia (an outlier).

Third, unearned income (mainly remittances) is only 6% of rural cash incomes and 4% of total income across all countries. Unearned income shares are particularly low in Nigeria (3%), Ethiopia (5%) and Malawi (7%), and higher in Uganda (11%), Tanzania (14%) and Ghana and Niger (13%). These findings dovetail with findings from detailed income surveys reviewed in Haggblade et al. (2010).

### 3.3. *Descriptive correlations of purchases and income and assets*

Table 6 shows shares of purchases in overall food consumption by household farmland holding, commercialization, and income characteristics. For each country, we categorize rural households as having above or below the average of farmland per capita, of the commercialization rate (the ratio of farm output sales to total output in value terms), and of RNFI share. The following points stand out.

First, for upper and middle strata countries, the food purchase share for below-land average households is about 7–10% higher than that for the above land-average households. In lower stratum countries, for Ethiopia, they differ by 13% on average over years, but only by 6% in Malawi and 5% in Niger. Thus, for 6 of 7 countries, the difference between the below versus above average landholders does not exceed 10% points. This is explained by the importance of RNFE for both low and high land groups, and the strong correlation of crop sales and farm size in all countries except Niger.

Second, the upper and middle strata countries show purchase shares that are only 5–9% higher for the low commercialization households compared with high commercialization households. By contrast, in two of the three lower stratum countries (Malawi and Niger), the high commercialization households have higher purchase rates, particularly in the poorest country, Niger (around 19% higher). We interpret this as meaning that in the upper and middle strata countries, the commercialization rate has a weak effect on the food purchase rate, presumably because RFNE is the dominant cash source for food purchase. In the poorer countries, the RNFE factor is less strong and having cash from crop sales has a much stronger effect.

Third, the "Non-farm income share" column of Table 6 shows RNFE

**Table 7**
Determinants of purchased share of **all foods** consumed: average marginal effects.

| Covariates | (1) | (2) | (3) | (4) | (5) | (6) | (7) |
|---|---|---|---|---|---|---|---|
| | GHA | NGA | TZA | UGA | ETH | MWI | NER |
| Income shares | | | | | | | |
| Non-farm income share | 0.13*** | 0.08*** | 0.18*** | 0.23*** | 0.13*** | 0.28*** | 0.31*** |
| | (0.01) | (0.01) | (0.02) | (0.02) | (0.02) | (0.02) | (0.03) |
| Transfer income share | 0.01 | −0.00 | 0.16*** | 0.22*** | 0.13*** | 0.27*** | 0.17*** |
| | (0.03) | (0.04) | (0.05) | (0.05) | (0.04) | (0.05) | (0.04) |
| Assets | | | | | | | |
| Farmland per capita | −0.02*** | −0.02 | −0.08** | −0.05 | −0.04 | −0.12*** | 0.00 |
| | (0.01) | (0.02) | (0.03) | (0.03) | (0.04) | (0.04) | (0.01) |
| Farmland per capita squared | 0.00** | 0.01 | 0.03** | 0.03** | 0.01 | 0.07*** | −0.00 |
| | (0.00) | (0.01) | (0.01) | (0.01) | (0.01) | (0.02) | (0.00) |
| Livestock wealth | −0.00 | −0.00* | −0.00** | 0.00 | −0.00* | −0.00 | 0.00* |
| | (0.00) | (0.00) | (0.00) | (0.00) | (0.00) | (0.00) | (0.00) |
| Market access | | | | | | | |
| Distance to market (log) | −0.01* | −0.03*** | 0.01*** | −0.02** | −0.02** | −0.03*** | −0.01 |
| | (0.01) | (0.01) | (0.00) | (0.01) | (0.01) | (0.01) | (0.01) |
| Agro-ecology & seasonality | | | | | | | |
| LS in favorable zone | −0.04** | −0.06*** | −0.01 | −0.03 | −0.09*** | 0.02 | −0.03 |
| | (0.02) | (0.01) | (0.02) | (0.02) | (0.03) | (0.02) | (0.02) |
| HS in favorable zone | −0.06*** | −0.09*** | −0.02 | −0.02 | −0.13*** | −0.05** | −0.07*** |
| | (0.01) | (0.01) | (0.02) | (0.02) | (0.03) | (0.02) | (0.02) |
| HS in less-favorable zone | −0.10*** | −0.04*** | −0.05** | −0.04 | −0.09*** | −0.03* | −0.07*** |
| | (0.02) | (0.01) | (0.02) | (0.02) | (0.03) | (0.02) | (0.02) |
| Demographics | | | | | | | |
| Female headed household | 0.01 | 0.01 | −0.03** | −0.02 | −0.02** | −0.02*** | −0.02 |
| | (0.01) | (0.01) | (0.01) | (0.02) | (0.01) | (0.01) | (0.01) |
| Age of household head | −0.00*** | −0.00*** | −0.00** | −0.00*** | −0.00*** | −0.00*** | −0.00*** |
| | (0.00) | (0.00) | (0.00) | (0.00) | (0.00) | (0.00) | (0.00) |
| Number of female adults | −0.00 | 0.01* | −0.02** | −0.01 | −0.00 | −0.00 | −0.01 |
| | (0.01) | (0.00) | (0.01) | (0.01) | (0.01) | (0.01) | (0.01) |
| Number of male adults | −0.00 | −0.01*** | −0.01* | −0.00 | −0.01 | −0.01 | 0.01 |
| | (0.01) | (0.00) | (0.01) | (0.01) | (0.01) | (0.01) | (0.01) |
| Age dependency ratio | −0.00 | −0.02*** | −0.02** | −0.01 | −0.01 | −0.02** | −0.00 |
| | (0.01) | (0.01) | (0.01) | (0.01) | (0.01) | (0.01) | (0.01) |
| Head is literate | 0.04*** | 0.05*** | 0.10*** | 0.03* | 0.01 | 0.01 | 0.01 |
| | (0.01) | (0.01) | (0.02) | (0.01) | (0.01) | (0.01) | (0.01) |
| Year fixed-effects included | Yes | Yes | Yes | Yes | Yes | Yes | Yes |
| Observations | 7812 | 9342 | 5199 | 5685 | 9657 | 4320 | 4378 |

Standard errors in parentheses; *p < .10, **p < .05, ***p < .01.

is strongly positively correlated with the share of food purchased, and that effect is highest in the middle and low income countries. The effect is present but weaker in higher income countries, perhaps because the distribution is tighter around the non-farm average. In the upper stratum countries, the above-average RNFE share households have a 15–16% higher share of purchases in food consumption, averaging around 77% over the years and countries – hence only 23% of their consumption is coming from their own farming, versus 61% for the RNFE-below-average household. In middle-income countries, the shares are 64% versus 41% for high- and low-RNFE. The story is similar in lower stratum countries with Ethiopia's and Malawi's high-RNFE households having 20% and 22% higher share of purchases in food consumption. Niger is an outlier in terms of the high food purchase shares for both below and above average RNFE earning households which might be because of the unfavorable farming conditions that require even households with lower non-farm cash sources to still buy a large share of their food.

## 4. Regression model, estimation methods, and results

### 4.1. Regression model

To identify the correlates of the share of purchases in food consumption, we use a panel data model that allows us to account for unobserved time-invariant household-specific characteristic as expressed in Equation (1):

$$foodpurchaseshare_{it} = \alpha + \boldsymbol{\beta X_{it}} + c_i + \delta_t + \varepsilon_{it} \quad (1)$$

where $foodpurchaseshare_{it}$ is the purchased share of foods consumed for household $i$ in time $t$ and $\boldsymbol{X_{it}}$ is a vector of covariates expected to explain the variation in purchased share of food consumed by households. Thus $\boldsymbol{X_{it}}$ includes demographic and socioeconomic characteristics of household $i$ at time $t$ such as household composition, literacy of the household head, household assets, income shares from RNFE and unearned income, livestock wealth (in tropical livestock units, TLU), and farmland owned. $\boldsymbol{X_{it}}$ also includes covariates such as distance to markets,[3] agroecological zone (which affects household production capacity and/or access to markets), and seasonality dummies.[4] $c_i$ refers to time-invariant unobserved household-specific heterogeneity that could be correlated with the observed covariates and purchase share in food consumption. $\delta_t$ are year fixed effects which we control for using time dummies. $\boldsymbol{\beta}$ is a vector of parameters (associated with the various covariates) to be estimated.

[3] We used geospatial data collected in the LSMS survey on household distance to the nearest major market or "key market centers" in kilometers (km).

[4] We constructed a seasonality variable that is a binary indicator of the period of the year when the survey collected data on food consumption. This variable takes on the value one if the consumption data were collected during the lean season (i.e., the months prior to the main crop harvest season), and zero if the consumption data were collected during the harvest season (i.e., during harvest and the immediate periods afterwards). For each country, we used information obtained from the "global information and early warning system on food and agriculture country brief" for each survey year to determine the survey-year-specific lean and harvest seasons (www.fao.org/glews).

**Table 8**
Determinants of purchased share of **grains** consumed: average marginal effects.

| | (1) | (2) | (3) | (4) | (5) | (6) | (7) |
|---|---|---|---|---|---|---|---|
| Covariates | GHA | NGA | TZA | UGA | ETH | MWI | NER |
| Income shares | | | | | | | |
| Non-farm income share | 0.12*** | 0.08*** | 0.20*** | 0.19*** | 0.11*** | 0.46*** | 0.56*** |
| | (0.02) | (0.02) | (0.02) | (0.03) | (0.03) | (0.03) | (0.05) |
| Transfer income share | −0.10** | −0.12 | 0.16* | 0.22*** | 0.08** | 0.51*** | 0.45*** |
| | (0.04) | (0.09) | (0.09) | (0.07) | (0.04) | (0.06) | (0.09) |
| Assets | | | | | | | |
| Farmland per capita | −0.02 | −0.06 | −0.05 | −0.15** | −0.12*** | −0.24*** | −0.00 |
| | (0.01) | (0.04) | (0.05) | (0.06) | (0.04) | (0.06) | (0.01) |
| Farmland per capita squared | 0.00 | 0.03 | 0.01 | 0.06** | 0.05*** | 0.12*** | −0.00 |
| | (0.00) | (0.02) | (0.02) | (0.03) | (0.02) | (0.02) | (0.00) |
| Livestock wealth | 0.00 | −0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00*** |
| | (0.00) | (0.00) | (0.00) | (0.00) | (0.00) | (0.00) | (0.00) |
| Market access | | | | | | | |
| Distance to market (log) | −0.04*** | −0.01 | 0.01*** | −0.01 | −0.01 | −0.01 | 0.01 |
| | (0.01) | (0.01) | (0.00) | (0.01) | (0.01) | (0.01) | (0.01) |
| Agro-ecology & seasonality | | | | | | | |
| LS in favorable zone | 0.05** | 0.20*** | 0.05 | 0.07*** | 0.05 | 0.00 | −0.04 |
| | (0.02) | (0.02) | (0.03) | (0.02) | (0.05) | (0.04) | (0.03) |
| HS in favorable zone | 0.05** | 0.17*** | −0.10*** | 0.05** | 0.04 | −0.11*** | −0.10*** |
| | (0.02) | (0.02) | (0.03) | (0.02) | (0.04) | (0.03) | (0.03) |
| HS in less-favorable zone | −0.08*** | −0.07*** | −0.14*** | −0.05** | −0.03 | −0.12*** | −0.04 |
| | (0.03) | (0.01) | (0.03) | (0.02) | (0.03) | (0.02) | (0.03) |
| Demographics | | | | | | | |
| Female headed household | 0.04*** | 0.01 | −0.05*** | 0.02 | −0.03 | −0.02 | −0.00 |
| | (0.01) | (0.01) | (0.02) | (0.02) | (0.02) | (0.01) | (0.02) |
| Age of household head | −0.00*** | −0.00*** | 0.00 | −0.00* | −0.00 | −0.00*** | −0.00*** |
| | (0.00) | (0.00) | (0.00) | (0.00) | (0.00) | (0.00) | (0.00) |
| Number of female adults | −0.00 | 0.01* | −0.03*** | −0.00 | −0.00 | −0.00 | −0.01 |
| | (0.01) | (0.00) | (0.01) | (0.01) | (0.01) | (0.01) | (0.02) |
| Number of male adults | −0.01 | −0.00 | −0.01 | −0.00 | −0.00 | −0.01 | 0.02 |
| | (0.01) | (0.00) | (0.01) | (0.01) | (0.01) | (0.01) | (0.01) |
| Age dependency ratio | 0.00 | −0.02** | 0.01 | −0.01 | −0.00 | −0.01 | 0.01 |
| | (0.01) | (0.01) | (0.01) | (0.01) | (0.01) | (0.01) | (0.01) |
| Head is literate | 0.05*** | 0.06*** | 0.12*** | 0.01 | 0.04*** | −0.01 | 0.01 |
| | (0.01) | (0.01) | (0.03) | (0.02) | (0.01) | (0.02) | (0.02) |
| Year fixed-effects included | Yes | Yes | Yes | Yes | Yes | Yes | Yes |
| Observations | 7812 | 9342 | 5199 | 5225 | 9657 | 4318 | 4378 |

Standard errors in parentheses; *p < .10, **p < .05, ***p < .01.

### 4.2. Estimation methods

Panel data allow us to control for time-invariant unobservable household-specific effects ($c_i$) such as the farmer's innate ability, which are expected to be correlated with the explanatory variables (Hausman and Taylor, 1981) and food purchase shares. If we assume that households are optimizers and aware of these household-specific factors in their decisions, then the unobserved household effects in the error term will be correlated with several covariates (particularly those such as income shares from various sources) resulting in a bias in standard ordinary least squares (OLS) estimation.

The correlated random effects (CRE) estimator provides an approach that allows for correlation between the unobserved time invariant household specific factors $c_i$ and included explanatory variables. We use the CRE model developed by Mundlak (1978) and Chamberlain (1980) that models the distribution of the unobserved household-specific variable conditional on the means of the strictly exogenous variables instead of treating it as a parameter to estimate. To operationalize the Mundlak–Chamberlain approach within the context of our fractional dependent variable (i.e., the purchase share in food consumption which ranges between 0 and 1), we use the CRE fractional probit regression model (Papke and Wooldridge, 2008). We ran a pooled regression of our dependent variable on the explanatory variables, including the means over the survey years of the time-varying explanatory variables ($\overline{\boldsymbol{X}}_{\mathbf{1i}}$) as additional regressors:

$$foodpurchaseshare_{it} = \alpha + \boldsymbol{\beta_1 X_{1it}} + \boldsymbol{\beta_2 X_{2i}} + \boldsymbol{\gamma}\overline{\boldsymbol{X}}_{\mathbf{1i}} + c_i + \delta_t + \varepsilon_{it} \quad (2)$$

where $\boldsymbol{X_{it}} = [\boldsymbol{X_{1it}}, \boldsymbol{X_{2i}}]$ distinguishes between time-varying covariates ($\boldsymbol{X_{1it}}$) such as income shares, assets, market access, and household composition on the one hand and time-invariant covariates ($\boldsymbol{X_{2i}}$) such as agroecological zone dummies and gender. Given the complex survey design described earlier, all our point estimates and standard errors are adjusted for the effects of sampling weights, clustering, and stratification.

### 4.3. Regression results

The results of the CRE fractional probit regressions of the purchased share by category (for all foods consumed, and for grains, roots and tubers, pulses, fruits and vegetables, and animal products) are shown in Tables 7–10. Table 7 shows regression results for all foods taken together; Table 8, for grains; Table 9, for fruits and vegetables; and Table 10, for animal proteins. Appendix Table A2 shows results for roots & tubers; and Table A3, for pulses. The following are the main findings that are statistically significant.

First, Table 7 shows that the share of non-farm income in total income has a strongly positive effect in all the countries, consistent with our descriptives above that non-farm income is a major source of cash income. The effect is stronger in lower income countries (except Ethiopia) compared with the upper and middle income study countries. The effect in middle income countries is also stronger than in the upper income countries. We tested (and rejected) the hypothesis that the coefficients are the same across the country strata using cross-model hypothesis testing. Moreover, while unearned income only accounted for about 5% of total income, the share of unearned income has a positive

**Table 9**
Determinants of purchased share of **fruits & vegetables** consumed: average marginal effects.

| | (1) | (2) | (3) | (4) | (5) | (6) | (7) |
|---|---|---|---|---|---|---|---|
| Covariates | GHA | NGA | TZA | UGA | ETH | MWI | NER |
| Income shares | | | | | | | |
| Non-farm income share | 0.08*** | 0.04*** | 0.09*** | 0.11*** | 0.02 | 0.14*** | 0.15*** |
| | (0.01) | (0.01) | (0.02) | (0.03) | (0.02) | (0.02) | (0.04) |
| Transfer income share | −0.04 | −0.04 | 0.11* | 0.13** | 0.01 | 0.10 | 0.11** |
| | (0.03) | (0.07) | (0.06) | (0.06) | (0.04) | (0.06) | (0.05) |
| Assets | | | | | | | |
| Farmland per capita | −0.03*** | −0.07** | 0.02 | −0.03 | 0.03 | −0.06 | 0.00 |
| | (0.01) | (0.03) | (0.04) | (0.06) | (0.05) | (0.04) | (0.01) |
| Farmland per capita squared | 0.00* | 0.03** | 0.01 | 0.03 | −0.01 | 0.02 | −0.00 |
| | (0.00) | (0.01) | (0.01) | (0.03) | (0.02) | (0.03) | (0.00) |
| Livestock wealth | −0.00 | −0.00*** | −0.00 | −0.00 | −0.00 | −0.00 | 0.00** |
| | (0.00) | (0.00) | (0.00) | (0.00) | (0.00) | (0.00) | (0.00) |
| Market access | | | | | | | |
| Distance to market (log) | 0.01 | −0.02 | −0.00 | −0.02 | −0.02** | −0.03** | 0.01 |
| | (0.01) | (0.01) | (0.00) | (0.02) | (0.01) | (0.01) | (0.01) |
| Agro-ecology & seasonality | | | | | | | |
| LS in favorable zone | −0.10*** | −0.12*** | −0.05 | 0.06** | −0.09 | 0.05 | −0.01 |
| | (0.02) | (0.02) | (0.04) | (0.03) | (0.06) | (0.04) | (0.03) |
| HS in favorable zone | −0.10*** | −0.14*** | 0.01 | 0.10*** | −0.06* | 0.05 | 0.02 |
| | (0.02) | (0.02) | (0.04) | (0.03) | (0.03) | (0.04) | (0.03) |
| HS in less-favorable zone | −0.04* | −0.03*** | −0.06 | 0.08*** | 0.01 | 0.07** | 0.00 |
| | (0.02) | (0.01) | (0.04) | (0.03) | (0.03) | (0.03) | (0.03) |
| Demographics | | | | | | | |
| Female headed household | −0.01 | −0.00 | −0.04** | −0.01 | −0.00 | −0.03** | −0.03* |
| | (0.01) | (0.01) | (0.02) | (0.02) | (0.01) | (0.01) | (0.02) |
| Age of household head | −0.00** | −0.00 | −0.00** | −0.00*** | −0.00 | −0.00*** | −0.00 |
| | (0.00) | (0.00) | (0.00) | (0.00) | (0.00) | (0.00) | (0.00) |
| Number of female adults | 0.01 | 0.01 | −0.00 | −0.00 | 0.02* | 0.01 | 0.00 |
| | (0.01) | (0.01) | (0.01) | (0.01) | (0.01) | (0.01) | (0.01) |
| Number of male adults | −0.00 | −0.00 | 0.00 | 0.01 | 0.00 | −0.01 | −0.01 |
| | (0.01) | (0.01) | (0.01) | (0.01) | (0.01) | (0.01) | (0.01) |
| Age dependency ratio | 0.00 | −0.01 | −0.01 | 0.00 | 0.00 | −0.02* | −0.02* |
| | (0.01) | (0.01) | (0.01) | (0.01) | (0.01) | (0.01) | (0.01) |
| Head is literate | 0.01* | 0.02* | 0.07** | 0.03 | 0.01 | 0.04** | 0.02 |
| | (0.01) | (0.01) | (0.03) | (0.02) | (0.01) | (0.02) | (0.01) |
| Year fixed-effects included | Yes | Yes | Yes | Yes | Yes | Yes | Yes |
| Observations | 7812 | 9342 | 5199 | 5565 | 9657 | 4318 | 4378 |

Standard errors in parentheses; *p < .10, **p < .05, ***p < .01.

effect (similar to that of non-farm income) in middle and lower income countries (see Table 8).

Second, Table 7 shows that food purchase shares decrease with farmland per capita, as expected, but as farms get big enough the farm cash income effect increases food purchases, especially of items not grown on the farm. As expected, purchases shares are high among the landless. Fig. 4 shows that bigger farms tend to be more specialized, and often in non-food cash crops as Dzanku et al. (2021) also show for Ghana. However, in all countries, only a small fraction of households (between 1% in Nigeria and 5% in Malawi) have farmland per capita above the threshold at which the effect turns positive, so the negative effect dominates.

Appendix Figures A8–A11 explore heterogeneity in the non-linear relationship between farmland per capita and food purchases by agro-ecology and seasonality, and how this might further be nuanced by type of commodity, i.e., non-perishables (grain staples) versus perishables (fruits and vegetables). Across agro-ecological zones of all the countries, the U-shaped relationship tends to hold, but the positive purchases tend to generally increase more with landholding in favorable zones than in less-favorable zones, showing the cash crop specialization effect. The exception is Ethiopia.

Third, space and time affect purchases. Given the zone, distance to market has a negative effect on food purchase shares. Purchases also differ over zones in ways that are conditioned by the season. Relative to the lean season (LS) in the less-favorable zone, food purchase shares are lower in the harvest season in either zone and in the lean season in the favorable zone. Thus, in most of the countries, households in the worst situation (season and zone combination) have to rely most on purchases to smooth consumption. Figure A3 (Appendix) provides details of pairwise comparisons of all seasonality-agroecology differences among the study countries.

Fourth, for overall food, female-headed households tend to have a lower purchase share in the lower and middle strata countries but higher shares in upper strata countries. The latter may be because in Ghana and Nigeria, rural female-headed households tend to have higher participation in non-farm employment, higher shares of unearned income, and smaller farm sizes than do male-headed households.

Fifth, socio-demographic variables have some surprising results. As expected, households with older heads tend to have a lower purchase share while the number of adults of either gender does not have a clear effect on food purchases. This might be because households with older heads have a predisposition to higher investments in the traditional home farm enterprise compared to younger households. Such a predisposition is likely to have more of an impact on household purchases than the composition of the household. However, surprisingly, the number of adults of either gender does not have a clear effect on food purchase shares. The dependency ratio reduces the food purchase share, perhaps because families with more children focus on starchy staples provision and postpone buying more expensive non-grains. Finally, literacy is positively correlated with the purchase share in upper and middle-income countries, but not in lower income countries except Niger. The reasons might be that literate households live closer to markets and know to diversify their diets with purchases.

The results for Tables (8–10) and Tables A2 and A3 showing shares of purchases in specific product categories are similar in sign but with fewer significant results to those for total food consumed (Table 7). The

**Table 10**
Determinants of purchased share of **animal proteins** consumed: Average marginal effects.

| | (1) | (2) | (3) | (4) | (5) | (6) | (7) |
|---|---|---|---|---|---|---|---|
| Covariates | GHA | NGA | TZA | UGA | ETH | MWI | NER |
| Income shares | | | | | | | |
| Non-farm income share | 0.04* | 0.05*** | 0.04 | 0.04 | −0.00 | 0.07*** | 0.07 |
| | (0.02) | (0.02) | (0.03) | (0.03) | (0.02) | (0.02) | (0.05) |
| Transfer income share | 0.02 | −0.03 | 0.04 | 0.05 | 0.03 | −0.09 | −0.09 |
| | (0.04) | (0.06) | (0.08) | (0.04) | (0.04) | (0.05) | (0.09) |
| Assets | | | | | | | |
| Farmland per capita | −0.03* | −0.02 | −0.03 | −0.08 | −0.14** | −0.10* | 0.02 |
| | (0.01) | (0.04) | (0.04) | (0.06) | (0.06) | (0.06) | (0.02) |
| Farmland per capita squared | 0.00** | −0.00 | 0.00 | 0.04 | 0.04 | 0.05* | −0.00 |
| | (0.00) | (0.02) | (0.02) | (0.03) | (0.03) | (0.03) | (0.00) |
| Livestock wealth | −0.00* | −0.00*** | −0.01** | −0.01*** | −0.00** | −0.01 | −0.01** |
| | (0.00) | (0.00) | (0.00) | (0.00) | (0.00) | (0.01) | (0.00) |
| Market access | | | | | | | |
| Distance to market (log) | −0.01 | −0.04*** | −0.00* | −0.02* | 0.01 | −0.02 | −0.01 |
| | (0.01) | (0.01) | (0.00) | (0.01) | (0.01) | (0.02) | (0.01) |
| Agro-ecology & seasonality | | | | | | | |
| LS in favorable zone | 0.01 | −0.06** | 0.00 | 0.03 | −0.05 | −0.04 | 0.01 |
| | (0.02) | (0.02) | (0.03) | (0.02) | (0.04) | (0.04) | (0.05) |
| HS in favorable zone | −0.03 | −0.10*** | 0.04* | 0.03 | −0.05 | −0.03 | −0.00 |
| | (0.02) | (0.02) | (0.03) | (0.02) | (0.04) | (0.04) | (0.04) |
| HS in less-favorable zone | −0.09*** | −0.02** | 0.02 | −0.03 | −0.03 | 0.01 | −0.11* |
| | (0.02) | (0.01) | (0.03) | (0.02) | (0.03) | (0.03) | (0.06) |
| Demographics | | | | | | | |
| Female headed household | 0.07*** | 0.01 | 0.01 | 0.01 | −0.02 | −0.01 | 0.01 |
| | (0.01) | (0.02) | (0.02) | (0.02) | (0.01) | (0.02) | (0.03) |
| Age of household head | −0.00* | 0.00 | 0.00 | −0.00* | −0.00** | −0.00* | −0.00 |
| | (0.00) | (0.00) | (0.00) | (0.00) | (0.00) | (0.00) | (0.00) |
| Number of female adults | −0.01 | 0.00 | −0.02 | 0.02** | 0.00 | −0.00 | 0.01 |
| | (0.01) | (0.01) | (0.02) | (0.01) | (0.01) | (0.01) | (0.02) |
| Number of male adults | −0.01 | −0.00 | −0.02 | 0.02 | −0.00 | −0.01 | 0.01 |
| | (0.01) | (0.01) | (0.02) | (0.01) | (0.01) | (0.01) | (0.03) |
| Age dependency ratio | −0.02* | −0.00 | −0.02 | 0.01 | −0.00 | −0.01 | 0.01 |
| | (0.01) | (0.01) | (0.02) | (0.01) | (0.01) | (0.01) | (0.03) |
| Head is literate | 0.06*** | 0.04*** | −0.01 | 0.04*** | 0.00 | −0.03** | 0.03 |
| | (0.01) | (0.01) | (0.03) | (0.01) | (0.01) | (0.01) | (0.02) |
| Year fixed-effects included | Yes | Yes | Yes | Yes | Yes | Yes | Yes |
| Observations | 7812 | 9342 | 5199 | 5685 | 9657 | 4320 | 4378 |

Standard errors in parentheses; *p < .10, **p < .05, ***p < .01.

following are the significant results from the product-specific tables.

First, the share of non-farm income in total income is associated with purchases of all food groups except for animal proteins in middle and lower income countries; rural households in the latter countries tend to consume from their own flocks and herds. Across the country strata, the effect of the share of non-farm in total income on grain purchases exceeds that of all other food categories in the lower income countries but not in the other country strata. This can be explained by Bennett's Law, whereby the poorer depend more on grains and would be more likely to buy grain with available cash.

However, the effect of the share of non-farm in total income is greater on the share of purchases in roots and tubers and pulses consumption in Ghana and Nigeria than for the other food components. This is because processed cassava, cowpeas, and peanuts are mainly purchased rather than laboriously home-processed and these crops are central staples in the diet although they are not grown by all households.

Furthermore, surprisingly, the effect of the share of non-farm in total income on the share of purchases in fruit and vegetable consumption is less than that for food in general, for starchy staples (grains in drier countries and roots and tubers in humid zone countries), and for animal products. This lower effect on horticultural purchases appears to suggest that persons depending more on non-farm income prioritize staples purchases perhaps with a view to "basic food security" (controlling for their farm size hence their ability to grow their own food).

Second, whereas unearned income was not important (relative to farm income shares) in driving overall food purchases in the upper income countries, they increased the purchase share of roots and tubers consumption. In the lower income countries (particularly Malawi and Niger) unearned income strongly affected the share of purchases in grains consumption.

Third, in the upper income countries, the seasonality-agroecology interaction effects on the purchase share of roots and tubers, fruits and vegetables, and animal products tell a similar story to that of overall food purchases – purchase shares are significantly higher during the lean season for households in the less-favorable zones – while those of grains and pulses differ sharply from it.

Relative to the lean season in the less-favorable zone, the lean season in the favorable zone is associated with a higher share of purchases in grains consumption in Ghana, Nigeria, and Uganda. Rice is mainly imported into these countries and has attained a major role among the staple grains consumed including in rural zones. In the favorable zones during the harvest season, roots and tubers and fruits and vegetables are less purchased than grains. For example, in Ghana and Nigeria, farm households tend to grow nongrains in year-round gardens in the humid zones while grain mainly comes seasonally from the drier Northern zones. The rural households in the favorable zones are also relatively well off, and tend (more than do the poorer households in less-favored zones) to buy rice and wheat which are luxuries and more expensive than the traditional foods (roots and tubers and millet).

In the lower- and middle-income countries, being in the harvest season in the less-favorable zone reduces the purchase share, as expected. By contrast, in Ghana and Nigeria, being in the harvest season (not just in the lean season as expected) in the favorable zone is correlated with a higher share of purchases (compared with the intercept

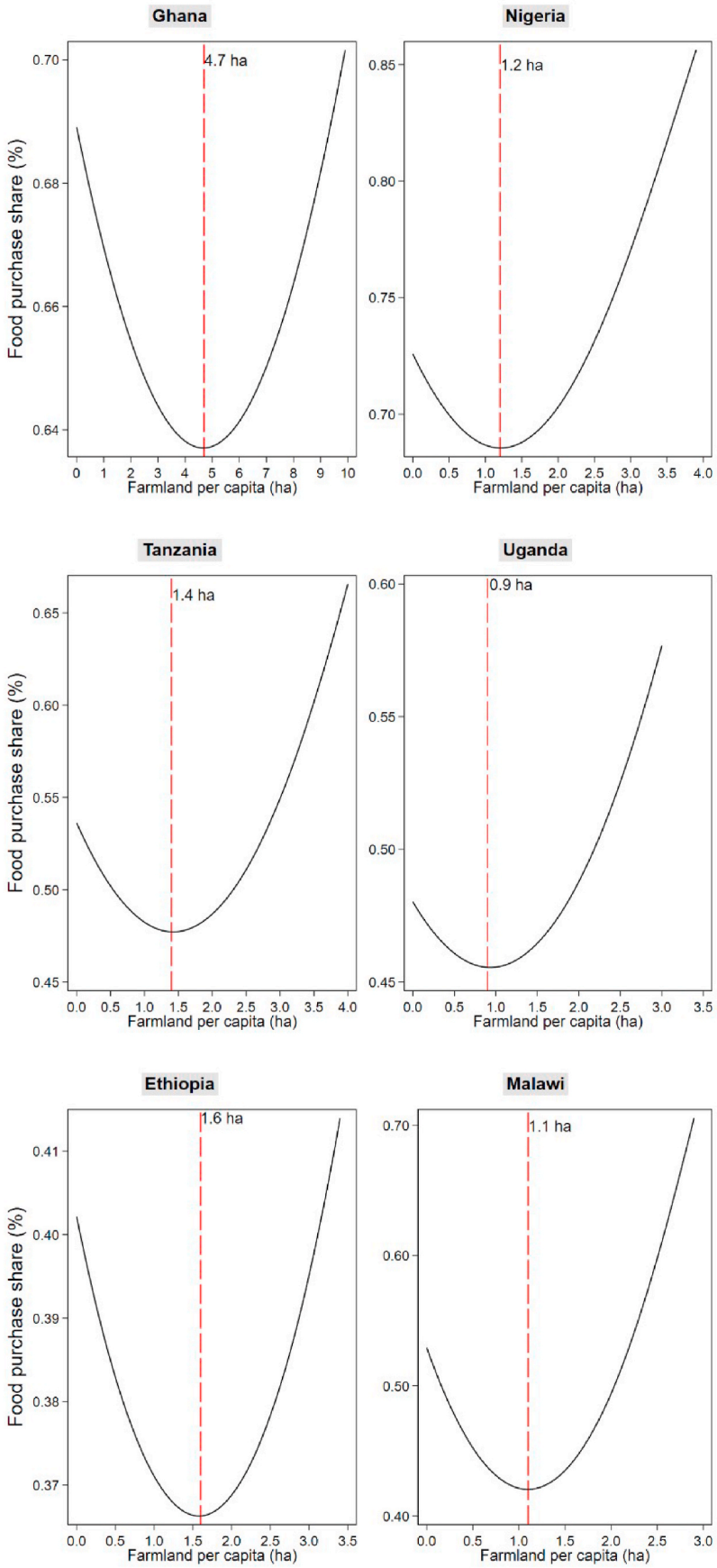


**Fig. 4.** Relationship between farmland and purchased share of food consumed. These graphs are from the correlated random effects fractional probit regressions.

term of being in the lean season in the less-favorable zone). This can be explained by the strong presence of cash cropping and non-farm income in linkages with the strong agriculture sector in the favorable zone in these upper stratum countries.

Comparing the results in Tables 7–10 with those in Tables A2-A7 (Appendix) shows that most of the correlates of purchase shares in food consumption differ over the years in terms of statistical significance and effect size. Several points stand out.

First, except for Tanzania, the non-farm income share effect magnitudes are larger for the latest waves of the surveys. For some products an effect was absent for the early waves of the period, usually a decade of data, and then emerged only recently, such as non-farm on purchase shares of fruits and vegetables in Ethiopia and animal products in Uganda, and unearned income on most food groups in Nigeria. It appears that the jumps were mainly due to increases in the share of cash income in total rural income, especially in the less-favored zones of most countries, over the decade, as shown in Fig. 1.

Second, a similar inversion between the early and late years of the survey data occurred with respect to the effect of the distance of the household to the main food market: this was negative at the start and then its significance disappeared later, particularly in Nigeria, Tanzania, and Uganda. This suggests that market access may have generally improved over time such as from road improvements.

Third, the negative effect seen in earlier years of the survey rounds of the household being female-headed lost its significance in later rounds in Tanzania, Ethiopia, and Malawi. In Ghana, the effect did not change over time but was even shown to be positive in the regression using the Ghana LSMS data that span 1992–2017 (Table A2).

## 5. Conclusions

While the literature on rural areas in Sub-Saharan Africa has observed purchases of food and in particular areas and years shown their importance, the literature has not yet had a systematic analysis of these purchases over countries of different incomes and rural population shares, over different agroecological zones favorable and less-favorable, over a series of years and high and low seasons, over food product categories, and as a function of apparently important drivers like rural non-farm employment (RNFE). We used nearly 65,000 observations in 7 countries over about a decade in rural Africa to examine the patterns and determinants of food purchases. The following are the key findings.

First, food purchases were found to be a substantial share of total food consumption in all three country strata – lower, middle, and upper. The purchase share was consistently the majority of food consumed.

Second, while the share of purchases was somewhat higher in less-favorable zones in the low season, fitting the traditional view of purchases as just occasional "coping" with low own-production of food or depleted stocks (Liverpool-Tasie et al., 2021), this was only the case in the lower-stratum countries. It was, importantly, not the case in upper- and middle stratum countries. In these latter, the purchase share was similar over seasons and agroecological ones – meaning it has become "structural". The latter we found to be due to the spread especially of RNFE in most countries, as the main/majority cash source, and in a few places, like Ghana, from the spread of cash cropping. Early work finding that cash cropping does not need to reduce nutrition or constrain food consumption (von Braun and Kennedy, 1994) finds further support in these findings where these sources of cash are important to food purchase including of nutrient-dense foods.

Third, while the literature had focused mainly on purchases of grain, we found that shares of purchases of both grains and non-grains were substantial, and even higher for non-grains than grains. Rural households across the countries were buying the great majority of their fruits and vegetables and animal products from the market, not relying mainly on own-production. Our literature review showed that in various places these products were not being bought from the local area's production but from areas far away but in the same country, such as in Senegal (Faye et al., 2023). That underscores the link between long supply chains from specialized areas of horticultural and animal product production to consuming areas all over the rural (and urban) areas, a point we emphasize below in implications.

Fourth, purchases are not a luxury – they are not done only by the upper income consumers, nor are they the last resort of the poor who cannot grow their food and have to buy to cope. Of course, both these cases occur, but in the main we found that purchases are done by all income terciles. They are fueled by widespread participation in working off the farm for various reasons, push and pull, and using the cash to buy food, not just grains, but non-grains too. Less common but also occurring (in Ghana) is non-food cash cropping driving these purchases and paying for them.

The food security strategy and policy implications of these findings are the following. First, food markets as a source of purchases, and often, supply chains plying between rural zones and urban and rural areas, are important to the food security of rural areas. This is not just in poorer areas but over a variety of zones, well-watered and dry, richer and poorer, in many countries. This points to the importance of infrastructure for supply chains such as roads and wholesale markets in rural towns.

Second, we showed the importance of rural non-farm employment for these purchases thus again highlighting the need for policies and programs that help that employment to grow and be equitably accessible (Haggblade et al., 2010).

## CRediT authorship contribution statement

**Fred M. Dzanku:** Conceptualization, Data curation, Formal analysis, Methodology, Writing – original draft, Writing – review & editing. **Lenis Saweda Onipede Liverpool-Tasie:** Conceptualization, Formal analysis, Methodology, Writing – original draft, Writing – review & editing. **Thomas Reardon:** Conceptualization, Formal analysis, Writing – original draft, Writing – review & editing.

## Declaration of competing interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

## Data availability

Data publicly available from World Bank.

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## Appendix A. Supplementary data

Supplementary data to this article can be found online at https://doi.org/10.1016/j.gfs.2024.100739.

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