



Biofortification in Food Systems

Lynn Brown

IFPRI Brown Bag:

Biofortification – Nutritionally Enriched Staple Crops,
the Foundation of the Food System

November 2020

HarvestPlus.org

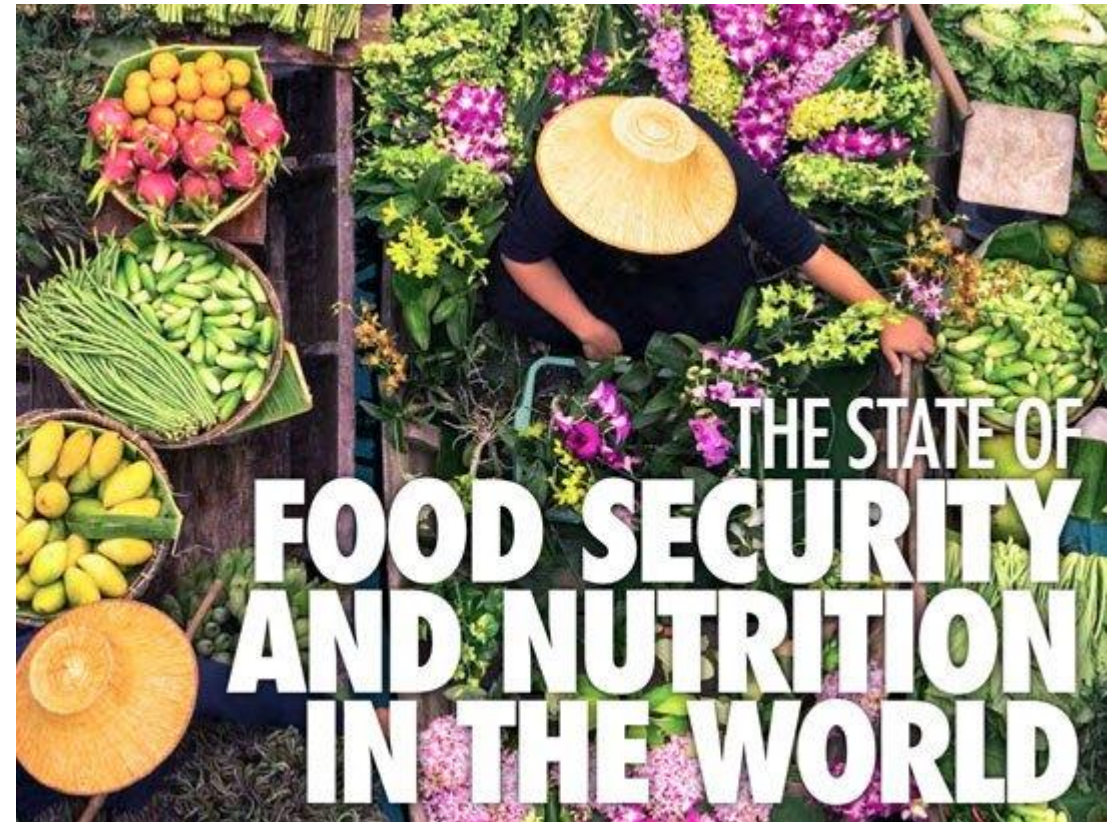


RESEARCH
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Agriculture for
Nutrition
and Health

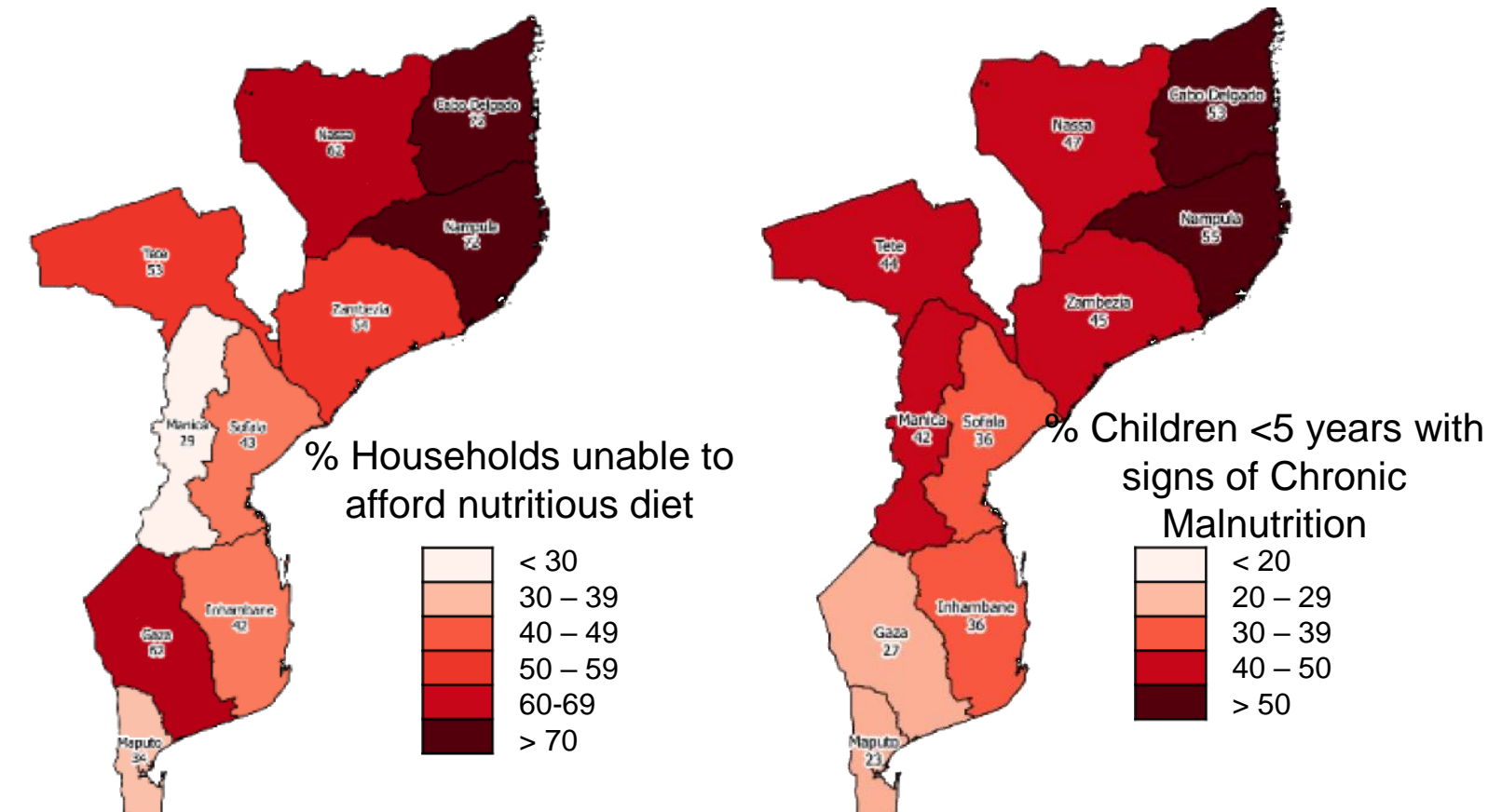
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UN 2020 SOFI Report highlights:

- 3 billion cannot afford a healthy diet – pre-COVID-19
- Healthy diets are **5 times more expensive** than diets that meet only dietary energy needs through a starchy staple
- **57% or more** cannot afford a healthy diet - sub-Saharan Africa and Southern Asia
- In Malawi
 - Energy suff't – \$.28, 1.3% cannot afford
 - Healthy diet \$2.85, 93.7% cannot afford



Access to nutritious diets is often lowest in areas with the highest malnutrition

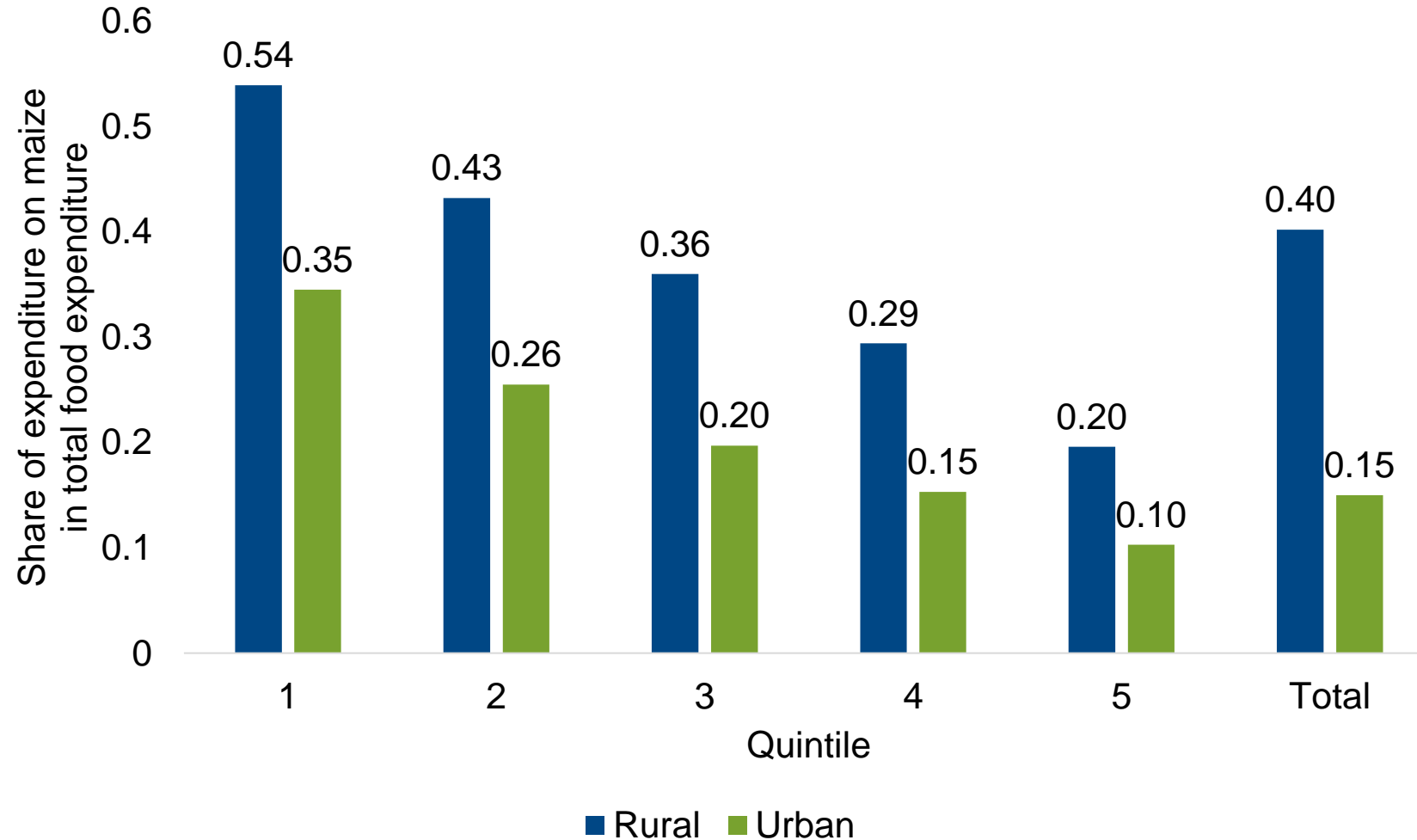


DHS (2011) and WFP (2017)

MOZAMBIQUE



Share of expenditure on maize in total food expenditure (by quintile)

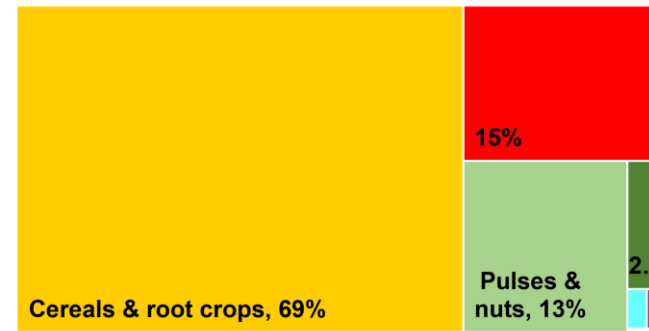
**MALAWI**

Micronutrient Sources in Malawi

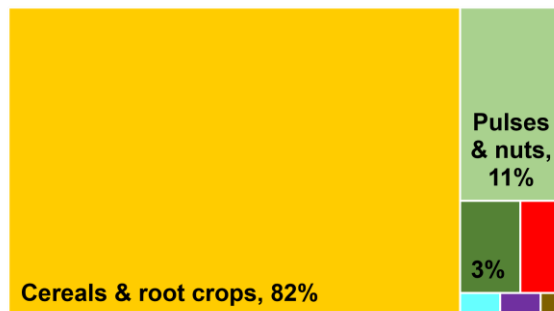
Calories



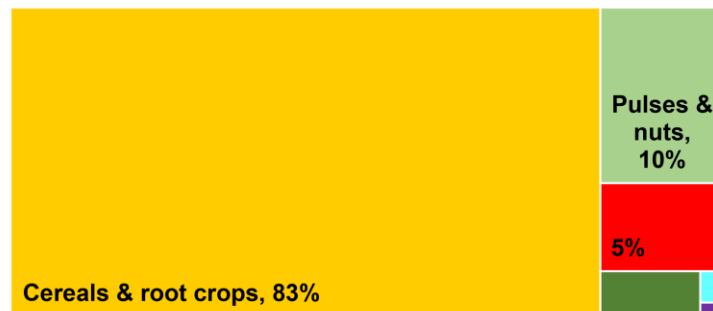
Protein



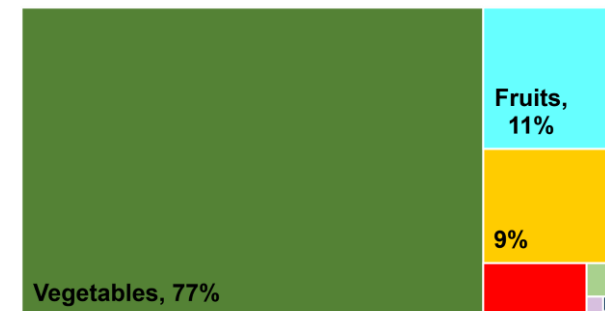
Vitamin A



Iron



Zinc



MALAWI



Agriculture – Food



- **Agricultural Breeding**

- **Focus**

- Yield
- Pest resistance
- Disease resistance
- Climate Smart – drought, salinity

- **Nutrition ???**

HarvestPlus Crops: Nutritional and Farmer Benefits



Iron Beans

Nutritional Benefits: Provides up to 80% of daily iron needs.

Farmer Benefits: High yielding, virus resistant, heat and drought tolerant.



Vitamin A Maize

Nutritional Benefits: Provides up to 50% of daily vitamin A needs.

Farmer Benefits: High yielding, disease and virus resistant, drought tolerant.



Zinc Maize

Nutritional Benefits: Provides up to 70% of daily zinc needs.

Farmer Benefits: High-yielding, virus resistant.



Iron Pearl Millet

Nutritional Benefits: Provides up to 80% of daily iron needs.

Farmer Benefits: High yielding, mildew resistant, drought tolerant.



Zinc Wheat

Nutritional Benefits: Provides up to 50% of daily zinc needs.

Farmer Benefits: High yielding, disease resistant.



Vitamin A Cassava

Nutritional Benefits: Provides up to 100% of daily vitamin A needs.

Farmer Benefits: High yielding, virus resistant.



Vitamin A Sweet Potato

Nutritional Benefits: Provides up to 100% of daily vitamin A needs.

Farmer Benefits: High yielding, virus resistant, drought tolerant.



Zinc Rice

Nutritional Benefits: Provides up to 40% of daily zinc needs.

Farmer Benefits: High yielding, disease and pest resistant.

The Evidence: Biofortified Crops Improve Nutrition and Health



Published, peer-reviewed research shows that:

- **Biofortified crops provide 25-100% of a child's average daily vitamin A, iron or zinc needs.**
- **Vitamin A** biofortified crops improve night vision and reduce vitamin A deficiency and diarrhea—leading causes of morbidity and mortality in young children.
- **Iron** biofortified crops reverse iron deficiency and iron-deficiency related anemia, reduce fatigue, and improve cognitive and physical performance.
- **Zinc** biofortified crops can improve immune function, and reduce stunting, the risk of diarrheal disease and respiratory infections, inflammation, pneumonia, vomiting, and fever.

The Evidence: Biofortification Is a Cost-Effective Strategy



Return on investment: As much as \$17 in health and productivity benefits for every \$1 spent on biofortification.*

Cost per disability-adjusted life year (DALY) saved is estimated at a highly cost-effective \$15-20.**

The crops are highly adaptable. Once a start-up investment in biofortified crops is made, they can be adapted by crop breeders to various regions and conditions at low additional cost.

*Source: Copenhagen Consensus

**According to World Bank criteria for cost-effectiveness of health interventions

The Evidence: Vitamin A

Zambia (Vitamin A Maize):

Increase in beta carotene concentrations and total body stores of vitamin A (Gannon et al., 2014; Palmer et al., 2016), and improvement in pupillary responsiveness (Palmer et al., 2016a)

Potential to help reduce aflatoxin contamination of maize (Suwarno et al., 2019).

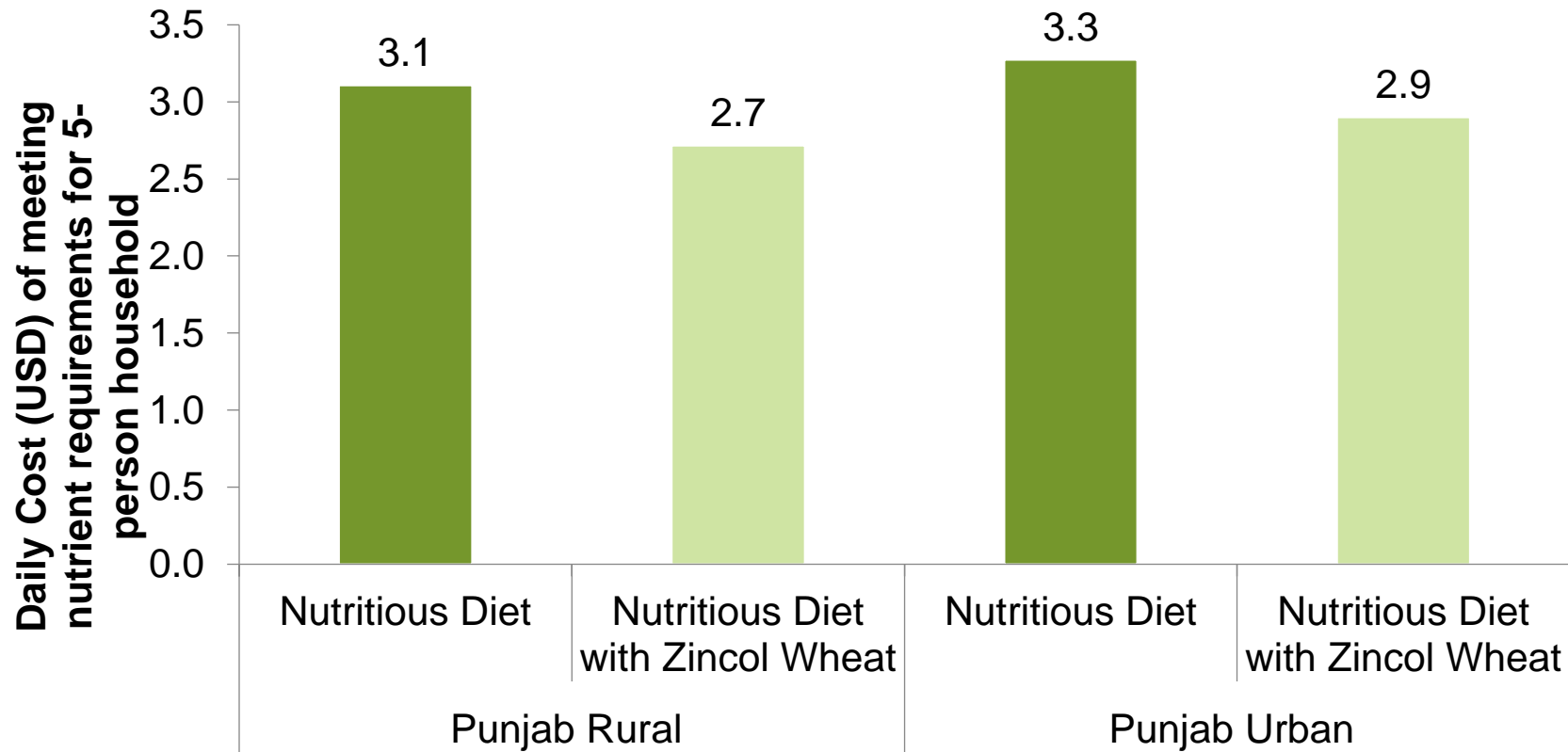
Farmers appreciated the yield, cob size, and cob-filling characteristics of the new varieties, as well as the taste and aroma of vitamin A maize preparations (Diressie et al., 2016)

Consumers in rural Zambia preferred *nshima* made with vitamin A maize more when compared to non-biofortified counterparts, even in the absence of nutrition information; nutrition information bringing in greater acceptance (Meenakshi, et al., 2012)

Malawi (Vitamin A Sweet Potato):

Consumers liked the sensory attributes (e.g., appearance, taste, and texture), and culturally accepted, specifically with regard to feeding the children (Hummel et al., 2018)

Introducing Zincol Biofortified wheat could reduce nutritious diet cost by 13%

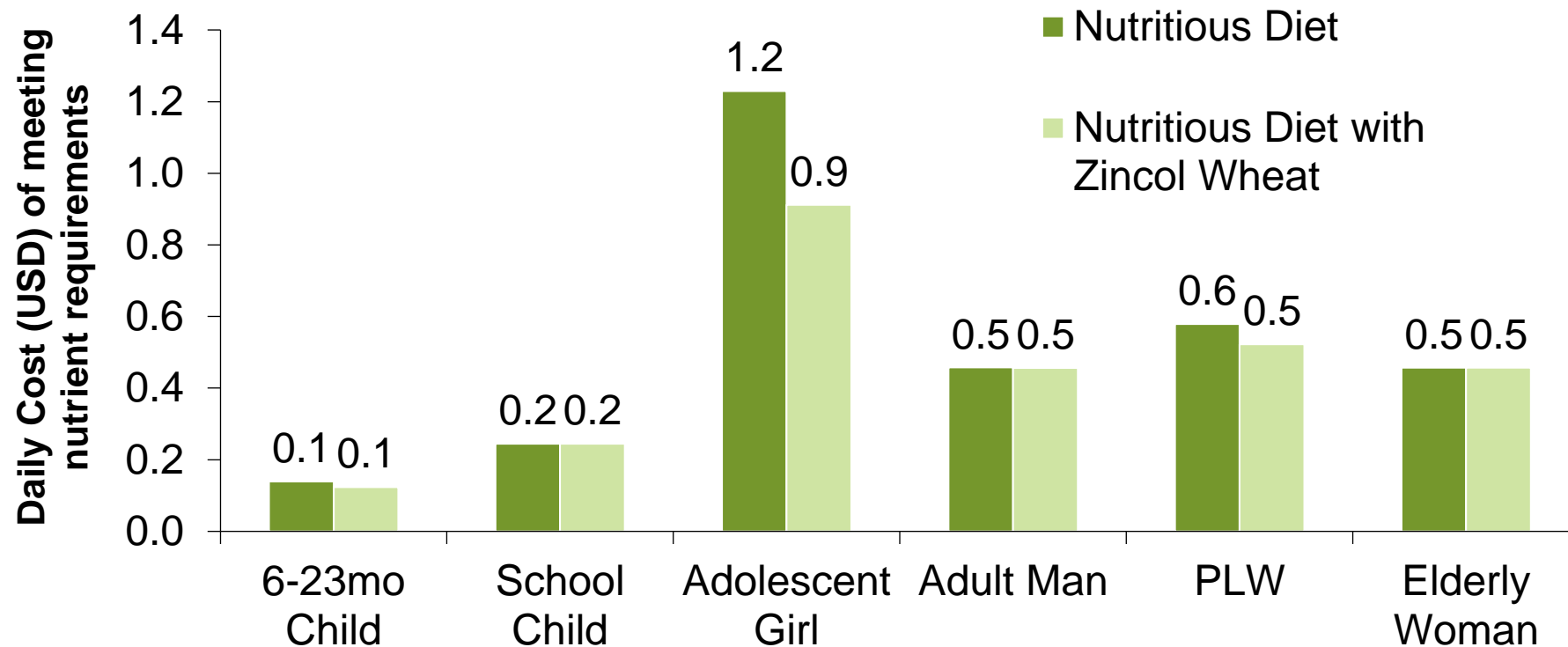


WFP (2019)

PAKISTAN



The impact of Zincol on nutritious diet cost varies by household member



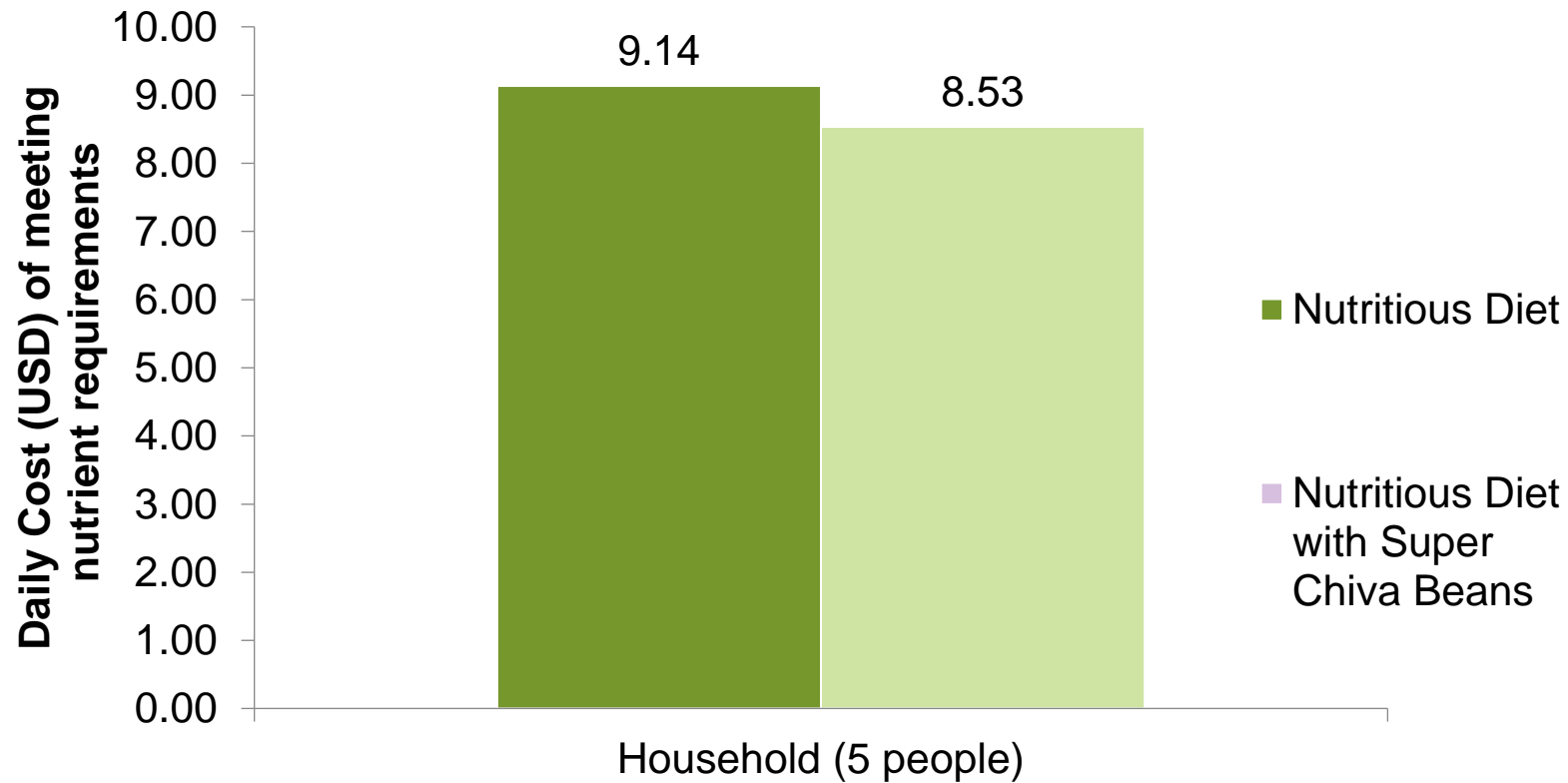
WFP (2019)

PAKISTAN



Rural Punjab

Introducing SuperChiva biofortified beans could reduce nutritious diet cost by 7%



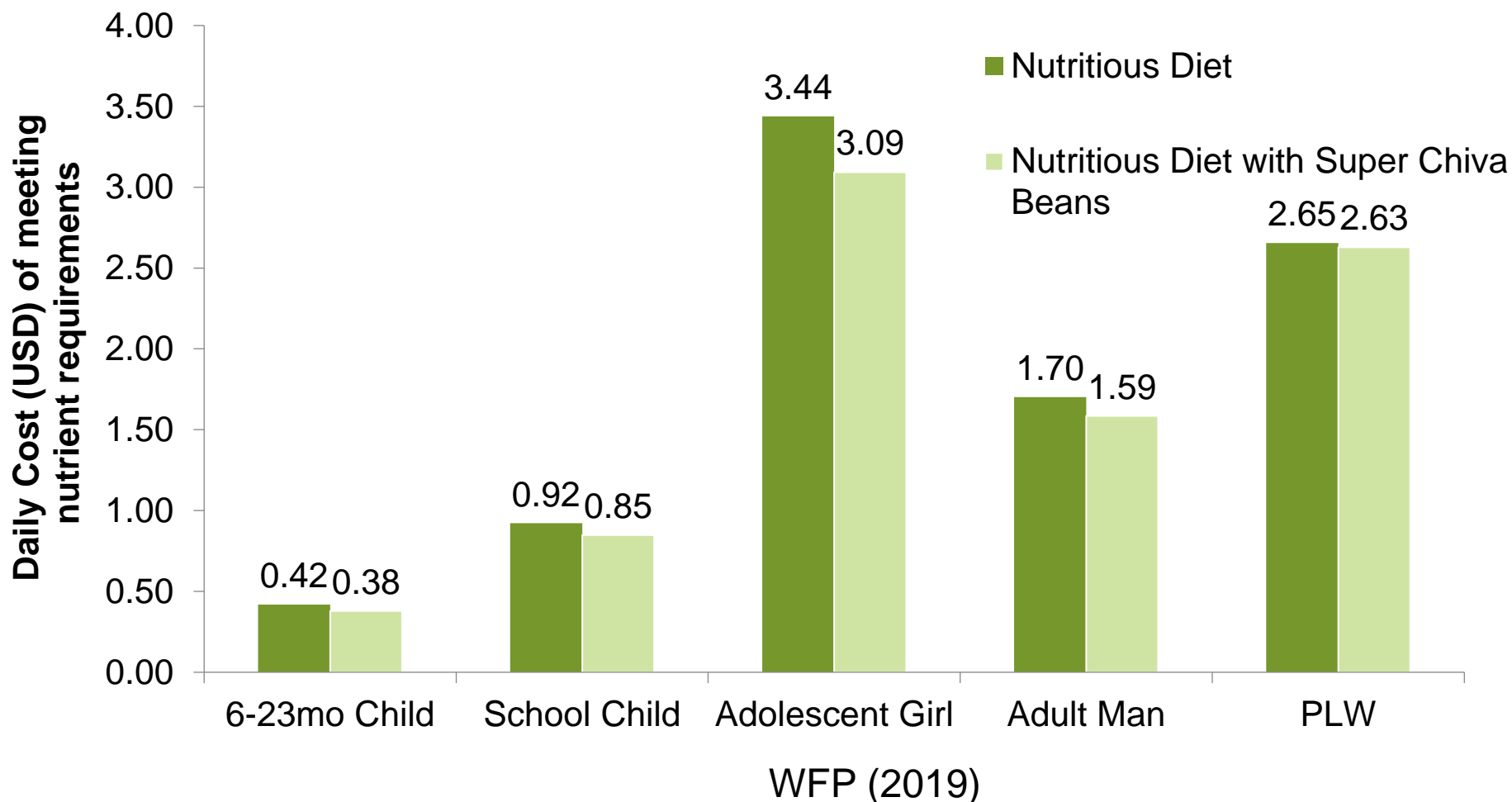
WFP (2019)

GUATEMALA



Western Highlands

The impact of SuperChiva on nutritious diet cost varies by household member



GUATEMALA



Western Highlands

Biofortification is Critical in Resilient Food Systems

- **Reduces the Cost of a nutritious diet**
- **Shocks to incomes and livelihoods**
 - Dietary change towards staple foods => more resilient micronutrient consumption
- **Shocks to food systems directly**
 - Most vulnerable are animal source foods, fruits and vegetables, staples are resilient
- **Nutrition program delivery – Vit A caplet distribution**
- **Biofortification as a base for fortification, ensuring greater reach**

Biofortification is the foundation of a more nutritious food system



Biofortification Delivery in Malawi

Dellings Phiri

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Crop Value Chains – Biofortified/Nutrient-Enriched Crops



Vitamin A Maize



Iron Beans



Vitamin A Cassava



Vitamin A Sweet Potato

Crop Value Chains

- **Vitamin A maize**
 - 10 varieties released, 4 commercialised
 - Food processing has commenced at small scale
 - Delivery catalyzed by HarvestPlus
 - Main crop for commercialization
- **Vitamin A Sweet Potato**
 - 9 varieties released, all commercialized
 - Food processing has on a large scale, both at commercial and community level
 - Delivery catalyzed by CIP
- **Iron Beans**
 - 3 varieties released, one commercialised
 - Delivery catalyzed by ABC
- **Vitamin A cassava**
 - 1 variety released, not commercialised
 - Delivery catalyzed by IITA

Biofortification Delivery Framework

- **Delivery through developmental channels (partnership projects)**
- **Delivery through the commercial route by catalyzing and enabling partnerships**
 - Crop Research and Development and Testing
 - Seed Multiplication
 - Distribution and demand creation
 - Food partnerships, Processing and Value addition
 - Retailers and Consumers
- **Advocating for biofortification Integration in key policy documents**
 - Govt and donor engagements
- **HarvestPlus Solutions**

Partnerships

- We have created over 40 partnerships for delivery across the value chain
- Focal points in Govt are DARS (technology anchor) and DNHA
- We have seed companies, CGIAR centres, local and international farmer organisations, NGOs, CBOs, food aggregators, processors and millers.

Policy Framework

- Biofortification is embedded in a number of key policy documents such as:
 - *National Agriculture Investment Plan 2018-2023*
 - *National Multi-Sectoral Nutrition Policy (2017-2021)*
 - *National Integrated School Health and Nutrition Policy*
 - *Malawi Growth and Development Strategy III (2018-2020)*
 - *National Multi-Sectoral Nutrition Strategic Plan (2018-2020)*
- This shows how committed the Govt is to scaling up biofortification through key public sectors

Scaling Up Actors

For biofortified crops/foods to reach the targeted rural and peri-urban communities, within the existing policy framework, there is need:

- 1. To integrate nutrient-enriched crops, key public seed and food systems through deliberate policies:**
 - School Feeding Program (biofortified school meals)
 - Grain aggregating agencies and programs (e.g. ADMARC and NFRA, WFP)
 - Affordable Input Program (AIP)
 - Agriculture Nutrition Sensitive Programs
- 2. For private sector participation in the delivery program (seed companies, agrodealers, processors, private aggregators etc.)**
- 3. For development partners to incorporate biofortified nutrient enriched crops in their nutrition sensitive agriculture programs**



Thank you!

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