



## Indaba Agricultural Policy Research Institute

### POLICY BRIEF

Number 74

Lusaka, Zambia

August 2015

Downloadable at [www.iapri.org.zm](http://www.iapri.org.zm) and  
<http://www.aec.msu.edu/fsz/zambia/index.htm>

## Agricultural Commercialization and Child Nutrition: Lessons from the Eastern Province of Zambia

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### KEY POINTS/SUMMARY

- Zambia, and in particular Eastern Province, has one of the highest levels of malnutrition in the world with 40% of the children having stunted growth.
- Agricultural diversification and commercialization remain critical for improving the nutrition status of children. However, the impact varies according to the level of diversification or commercialization.
- This study found that for commercialization, there is highest risk of stunting at medium commercialization levels at 50%. A farm at this point can improve nutrition status by moving either towards high or towards zero levels.
- Commercialization has a negative effect on short-term nutrition outcomes leading to underweight and wasting. This could indicate that in areas with less everyday access to a range of food items, capital accumulation may not help to avoid deficiencies in child nutrition.
- In combination with our studies on diversification, two policy options can be recommended. Either the households specialize in cash crops to increase income, or they go into subsistence farming with high levels of diversification. Other off-farm income sources are suggested for resilience in case of yield shocks.

**INTRODUCTION:** Zambia has one of the highest rates of child malnutrition in the world. The most vulnerable are the rural households that highly depend on seasonal food production and survive on diets that are deficient in a variety of micronutrients. Prolonged malnutrition during childhood leads to devastating effects on the wellbeing of an individual and on the performance of a country's economy. Studies have shown that children that suffer from chronic malnutrition during the first two years of life tend to suffer from irreversible negative effects on brain and cognitive development, as well as stunting (UNICEF 1992). As prevalence of stunting and wasting among small children was still twice as high in 2014 than the target values of the Millennium Development Goals, Zambia is likely to fail the MDG of halving the rates of malnutrition in 2015.

Recent international discussions have focused on nutrition sensitive agriculture as one solution against child malnutrition. Agricultural diversification and commercialization provide alternative strategies to improve diets in rural areas

(Hendrick and Msaki 2009; Khandker and Mahmud 2012). Thus, farms can produce a variety of crops to provide diverse food items for own consumption, or can commercialize to increase income and the household's ability to purchase a diverse range of food items.

This study examines the extent to which commercialization and agricultural diversification can help reduce child malnutrition in Eastern Province, which has one of the highest rates of malnutrition in the country. More than 50% of the children in the province have stunted growth. In addition, Eastern Province has one of the highest rural poverty rates, approximately 78% and this rate is 17 percentage points above the country's average. Behind this backdrop, Eastern Province is surprisingly one of Zambia's most productive regions in terms of agriculture, both crops and livestock. This brief summarizes results from a study that analyzed whether agricultural diversification and commercialization provides the solution for solving the problem of high child malnutrition in the province.

**DATA AND METHODS:** To examine the impact of agricultural diversification and commercialization, a unique combination of two datasets collected in 2012, Rural Agricultural Livelihood Survey (RALS) and Feed the Future Baseline survey (FTFB) from the same households were used. The RALS collected detailed agricultural production and marketing information about the households, while the FTFB collected anthropometric data from women and children under the age of five. Combining the two datasets, 1120 children were recorded from the different households.

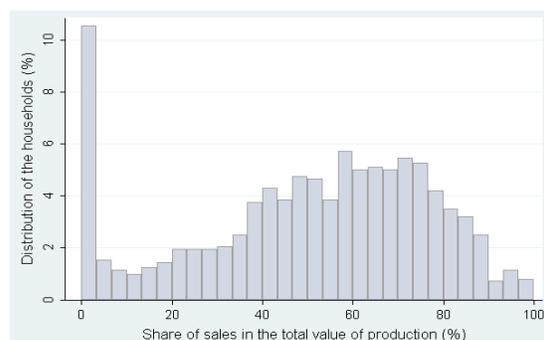
The study applied generalized propensity score (GPS) approach, which helps measure the impact of different intensities of an intervention. In our case, GPS was used to analyze the impact of agricultural diversification and commercialization on three nutritional status indicators: 1) height for age, indicating stunting; 2) weight for height, indicating wasting; and 3) weight for age, indicating underweight. Stunting is the result of long-term insufficiencies in food intake, while underweight and wasting measure medium and short-term deficiencies. Underweight manifests itself as a combination of stunting and wasting.

Commercialization was measured as the share of agricultural sales in household's total value of agricultural production. Agricultural diversification is calculated using a diversity index (Simpson Index). It takes into account the amounts of calorie production of the major food groups that were regularly consumed among the sample group: starchy foods, legumes-nuts-seeds, starchy vegetables, non-starchy vegetables, starchy fruits, non-starchy fruits, dairy, and eggs. Calories were used, since a more diverse range of calorie sources typically also increases availability of other nutrients. More details about the data and methods can be found in a working paper from which this brief is based (Mofya-Mukuka and Kuhlitz 2015).

**FINDINGS:**

**Impact of Commercialization on Child Malnutrition:** Ninety percent of the sample households in Eastern Province produce for the market, whilst the remaining 10% are purely subsistence farmers. The degree of commercialization has a bimodal distribution (Figure 1) with the majority of households having a commercialization index of 40% and above.

**Figure 1. Distribution of Household Degree of Commercialization**

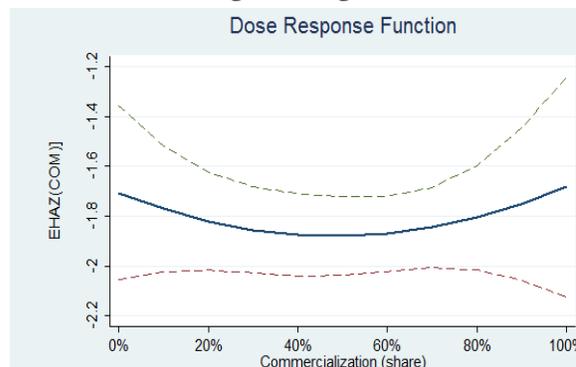


Source: Authors based on IAPRI 2012; USAID 2012.

The impact of commercialization on the three child nutrition outcomes is non-linear for stunting (Figure 2) and almost linear for the short and medium term nutritional outcomes, wasting and underweight (Figures 3 and 4). Higher values on the y-Axis indicate better nutritional outcomes. In particular, the GPS results show that:

*Impact of Crop Commercialization on Stunting.* Very low levels of agricultural commercialization result in better stunting outcomes than medium-level commercialization. Beyond the point of 50%, there is a positive impact on stunting, which rises with increased levels of agricultural commercialization (Figure 2). This finding implies that households that are highly commercialized (beyond 50%) and those that hardly sell their produce (probably consume everything they produce) are less likely to have malnourished children.

**Figure 2. Effect of Agricultural Commercialization on Reducing Stunting**

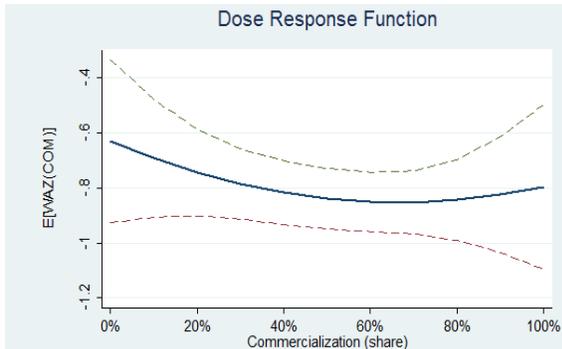


Source: Authors based on IAPRI 2012; USAID 2012. Note: For figures 2-7, the straight line is the dose response function and dashed lines indicate the 95% confidence interval.

These results may suggest two possible strategies that can tackle stunting for different target groups: a) promote crop commercialization beyond 50% levels as higher commercialization reduce stunting levels; and b) encourage households with other non-farm income opportunities to produce own food and prioritize home consumption instead of the market.

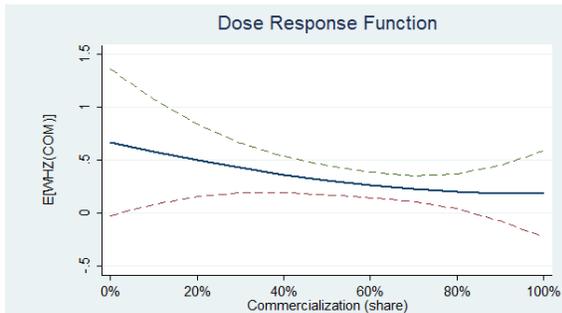
*Impact of Commercialization on Wasting and Underweight.* In contrast to stunting, we find that an increase in the intensity of commercialization has a negative impact on both underweight and wasting. (Figures 3 and 4). This implies that commercialization and relying more on purchased foods may not be a solution for solving temporary malnutrition arising from a shock. Instead, consumption from own production provides a solution from having underweight and wasted children. During crisis situations, markets alone may not provide access to the diverse range of nutrients needed, which is why farm households use food from own sources as a short-term buffer.

**Figure 3. Effect on Agricultural Commercialization on Reducing Wasting**



Source: Authors based on IAPRI 2012; USAID 2012.

**Figure 4. Effect of Agricultural Commercialization on Reducing Underweight**



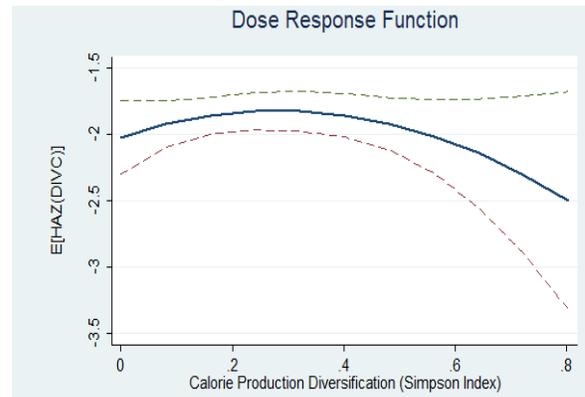
Source: Authors based on IAPRI 2012; USAID 2012.

**Impact of Agricultural Diversification on Child Malnutrition:** The impact of calorie source

diversification on stunting, wasting, and weight loss is non-linear. As can be seen in Figure 5, the impact on stunting follows an inverted-U pattern while the impact on wasting and weight loss has a U shape.

*Impact of Agricultural Diversification on Stunting.* The impact of calorie production diversification on reducing stunting increases with increase in calorie diversification up to an optimal level of 0.3. Beyond this level, higher levels of diversification exacerbate the stunting levels (Figure 5). This implies that promoting very high calorie production diversification at household level may not help solve the high stunting levels in Eastern Province. It is likely that a higher calorie source diversification comes at the expense of efficiently producing enough nutrients required to maintain good levels of child nutrition in the household compared to less diversified farms.

**Figure 5. Impact of Calorie Source Diversification on Stunting**



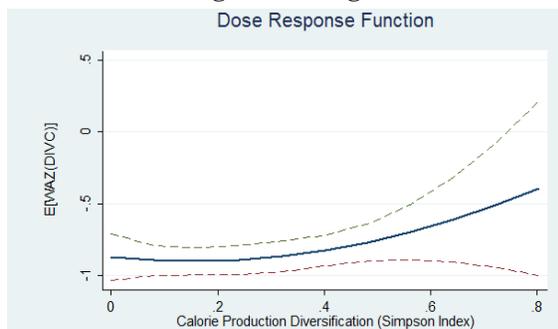
Source: Authors based on IAPRI 2012; USAID 2012.

*Impact of Agricultural Diversification on Wasting and Underweight.* The results on the impact of calorie source diversification on wasting and underweight show a positive relationship between calorie diversification and the children's nutritional status (Figures 6 and 7). Thus, high levels of diversifications may help prevent households from sudden and short-term nutrient deficiencies through the provision of a diverse set of nutrients from the different agricultural products.

Further analyses on the diversity of protein production sources have been carried out, which are presented in detail in Mofya-Mukuka and Kuhlitz (2015). It has been found that protein diversification has little impact on stunting. However, at higher levels of protein diversification

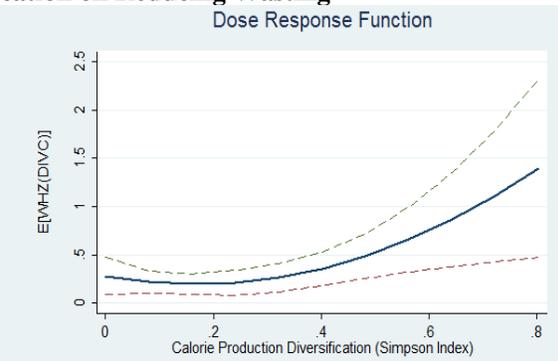
there is a noticeable positive effect on underweight and wasting. Protein is significantly sourced from continuously provided animal products like milk and eggs, which might help stabilize nutrition.

**Figure 6. Impact of Calorie Source Diversification on Reducing Underweight**



Source: Authors based on IAPRI 2012; USAID 2012.

**Figure 7. Impact of Calorie Source Diversification on Reducing Wasting**



Source: Authors based on IAPRI 2012; USAID 2012.

**RECOMMENDATIONS:** Agricultural Diversification and commercialization remain critical for improving the nutrition status of children in Zambia. However, there are important aspects of improving nutritional status of children with the two agricultural strategies that need to be taken into account. First, the above results have shown that intensity of treatment at household level matters in the nutrition status of the children. Second, it is important to align strategies of agricultural production diversification according to nutrient-related food groups because different food groups have varying impact on different forms of malnutrition. Third, the impact on stunting is non-linear, an indication that specialization in very few crops results in a permanently less diverse diet with accumulating long-term consequences for nutritional status of the child. On the other hand, high diversification worsens stunting levels, since a too fractioned food production becomes increasingly inefficient to manage.

Commercialization does not reveal as much benefit as could be expected in terms of short-term nutrition impacts. There might be factors that impede a positive nutrition effect of income generated through commercialization. For example, gender issues associated with commercialization, i.e., who has control over the income earned and what is purchased. Such factors need to be identified and sorted out.

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## ACKNOWLEDGEMENTS

The Indaba Agricultural Policy Research Institute is a non-profit company limited by guarantee and collaboratively works with public and private stakeholders. IAPRI exists to carry out agricultural policy research and outreach, serving the agricultural sector in Zambia so as to contribute to sustainable pro-poor agricultural development. The authors are grateful to Patricia Johannes for providing editorial assistance. The authors acknowledge financial support from Embassy of Sweden through the Swedish International Development Agency and the United States Agency for International Development/Zambia Mission.

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