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MAPPING THE LINKAGES BETWEEN

AGRICULTURE, FOOD SECURITY & NUTRITION

IN MALAWI

Edited by Noora-Lisa Aberman, Janice Meerman, and Todd Benson

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CHAPTER 5 : FOOD AND NUTRITION SECURITY IMPLICATIONS OF CROP DIVERSIFICATION IN MALAWI'S FARM HOUSEHOLDS

John Mazunda[a], Henry Kankwamba[b], and Karl Pauw[a]

[a] International Food Policy Research Institute; [b] Independent Consultant

Although dramatic increases in maize yields since the implementation of the Farm Income Subsidy Program (FISP)—the major national program that subsidizes fertilizer and improved seed primarily for maize cultivation—have likely enhanced household maize self-sufficiency (Chibwana et al. 2012), Malawian diets remain poorly diversified. Indeed, the contribution of foods other than maize to national per capita dietary energy supply appears to have actually decreased slightly in recent years.

Poorly diversified diets characterized by an overreliance on starchy staples are a red flag for malnutrition. Conversely, diets which include a variety of foods are considered important for positive health. Diets which include nutrient-rich legumes and animal-source foods as well as vitamin-rich fruits and vegetables are associated with micronutrient adequacy and reductions in chronic undernutrition (Arimond and Ruel 2004; Thompson and Amoroso 2011).

While crop diversification is an explicit goal of the Government of Malawi, continued support to achieving maize self-sufficiency through the provision of input subsidies also remains a strong policy objective (MOAFS 2011). Theoretically, these two objectives are not mutually exclusive; increasing maize yields through intensification methods, such as those involving increased use of inorganic fertilizer and improved seed facilitated by the FISP subsidies, could potentially free land resources for cultivation of other, more nutrient-dense food crops (Arndt, Pauw, and Thurlow 2013). However, this hypothesis assumes that diversification in household-level production of food crops does, indeed, lead to diversification in the diets of individuals, with possible subsequent positive results their nutritional status.

Evidence on this assumption is scant. Although a large number of empirical studies analyze the determinants of crop diversification *or* dietary diversity, only a handful assess causal linkages between the two (Herforth and Harris 2014; Hirvonen and Hoddinott 2014; Remans et al 2014). For Malawi specifically, a recent study presented new evidence on precisely this pathway. Using the nationally-representative IHS3 survey data, Jones, Shrinivas, and Bezner-Kerr (2014) found that farm production diversity was associated with greater household-level dietary diversity.

Our study builds on these results by analyzing the same IHS3 data on household-consumption, but with an additional focus on the determinants of crop diversification and looking more specifically at micronutrients. In addition to constructing a household dietary diversity score (HDSS), we also construct Household Micronutrient Access indicators to estimate the effect of crop diversification on household access to zinc, iron, vitamin A, and folate. In so doing, we attempted to further refine Malawi-specific findings on pro-nutrition investment returns from food-crop diversification.

Malawian woman farms groundnut plot

Our results indicate significant and positive associations between food-crop production diversification and both nutrition indicators. The strongest associations were for households' micronutrient access. Production diversification was associated with a 35 percent increase in access to iron, a 47 percent increase in access to vitamin A, a 45 percent increase in access to folate, and a 35

percent increase in access to zinc. These findings support the hypothesis that crop production diversification is a viable option to increase nutrition sensitivity in agriculture.

5.1—Plausible impact pathways

Three main theoretical pathways can be used to hypothesize the effects of crop production diversification on household food security and the diets of household members. They correspond directly with the pathways described by the conceptual framework on causal pathways from agriculture to nutrition provided in Chapter 1.

- Production diversification can directly alter the food a family consumes if they eat what they produce, as most farm families in Malawi do. If a farm family produces a more diverse set of foods, then they have access to consuming a more diverse set of foods. Furthermore, if some of these foods are sold, then others who rely on markets for meeting some of their food needs will also have access to a more diverse set of foods.
- Production diversification can lead to increased income for farm families with which they can buy more diverse and more nutritious foods. This can be achieved through the production of marketable, higher-value crops if local markets are able to offer producers good prices for those crops. It is important to note that the extent that agricultural income influences household nutrition and food security depends on a number of factors, including the characteristics of food markets, decisions on household food purchases, and household nutritional knowledge. Depending on how these factors—captured in the enabling environment component of our conceptual framework—come together, agricultural income generating activities can have a positive, negative, or neutral effect on nutritional outcomes (World Bank 2007).
- The degree to which the above two pathways will lead to improved food security and diets is moderated by the bargaining power and control that women have over choices about: 1) consumption of what the family produces, and 2) the use made of income from crop sales.

5.2—Methods

We used data from the IHS3 for this analysis. Carried out between March 2010 and March 2011, the nationally representative survey is designed to provide information on various aspects of household assets, consumption, and welfare in Malawi. It includes a household questionnaire that has modules that cover a range of topics, including household income, food and non-food consumption, demographics, education, asset holdings, and employment.

With respect to agriculture, households surveyed for the IHS3 provided detailed reporting on cultivation and production practices for the most recently completed rainy and dry seasons, including any input subsidies received. Our analysis here used information provided by the 10,234 sample households from the IHS3 who defined themselves as “agricultural”, that is, “involved in agricultural or livestock activities” (NSO 2012).

Production practices were assessed based on the definition of crop diversification used by the Ministry of Agriculture, Irrigation, and Water Management, which is “the production of more than one crop”. Household dietary diversity was assessed using Household Dietary Diversity Scores (HDDS) and Micronutrient-sensitive Household Dietary Diversity Scores (MsHDDS):

- The HDDS was calculated based on a simple counted score of how many food groups from a total of 12 food groups sample household reported consuming food over the past seven days. This score was constructed from IHS3 recall data on food expenditures and household consumption.
- The MsHDDS disaggregates and reorganizes the HDDS food groups into 16 micronutrient-based groups. As with the HDDS, MsHDDS were calculated based on a simple counts taken from IHS3 recall data.

- Constructed from detailed IHS3 recall data on what all household members ate, we estimate the per-capita calorie and micronutrient intake of the survey sample households based on the quantities of foods they reported consuming. These calculations were used to estimate Household Micronutrient Access indicators for iron, vitamin A, folate, and zinc.

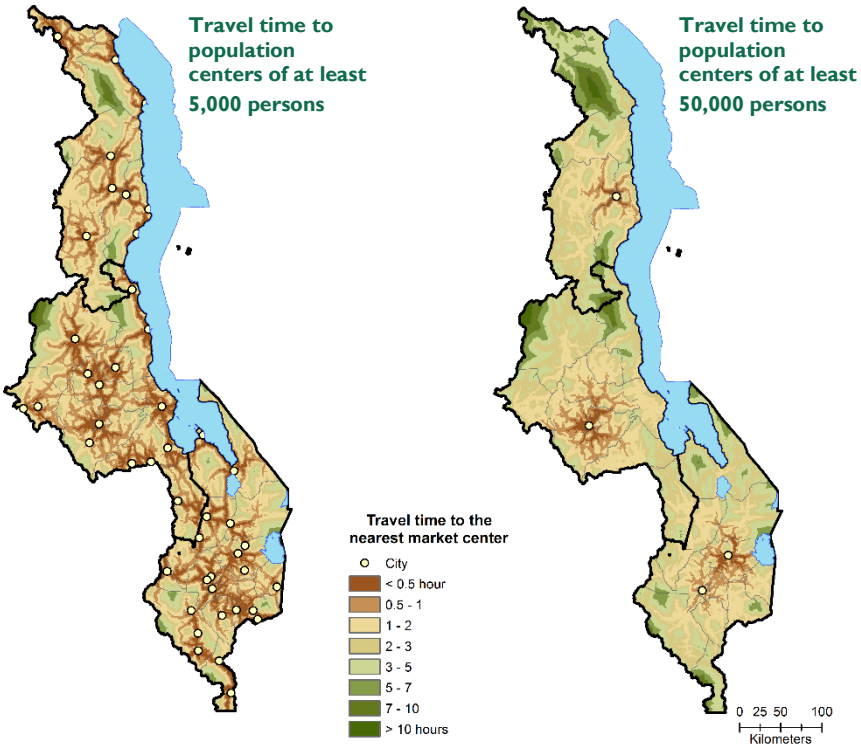
Based on these variables and econometric models, a series of regression analyses were conducted to identify the determinants of production diversification and the degree that production diversification is associated with HDDS, MsHDDS, and Household Micronutrient Access. For each regression, we controlled for demographic and socioeconomic characteristics.

5.3—Findings

A majority (76 percent) of the sample was categorized as practicing some crop diversification and about half (53 percent) reported being engaged in crop sales. Only 8 percent of the sample reported having access to credit, 46 percent reported access to extension services, and 54 percent reported receiving fertilizer subsidies. The average distance to the nearest local market was 7 kilometers. (See Figure 5.1 for maps of travel time to larger market centers.) The average landholding was less than one hectare (0.75).

Education (19 percent), size of land holdings (198 percent), access to subsidized fertilizer (38 percent), and market participation (86 percent) were all positively and significantly associated with crop diversification. The association with access to extension services was also positive and significant, though with a smaller effect at 8 percent. Interestingly, access to credit is negatively and significantly associated with diversification (-12 percent). There was also a positive and significant, albeit small at 0.01 percent, association between distance to markets (Figure 5.1) and crop diversification—that is, the greater the distance from markets the more likely a household is to diversify its production.

Figure 5.1—Maps of travel time to market centers in Malawi with populations of 5,000 and 50,000 persons



Source: Analysis by M. Kedir, IFPRI, of spatial data for Malawi on population centers, the road network, and land use and land cover.

Mean HDDS for surveyed households was 7.9 for the 12 groups. Crop diversification was associated with a substantial 19 percent increase in HDDS and MsHDDS. However, when the data

were disaggregated into urban and rural households, families living in rural areas appeared to be at a distinct disadvantage, with regression results showing rural households to be associated with a 25 percent decrease in HDDS and 24 percent decrease in MsHDDS. While the effect is quite small at 0.5 percent, owning some livestock is also positively and significantly associated with HDDS and MsHDDS.

With respect to micronutrients, results indicated a significant and positive association between crop diversification and all four indicators of household micronutrient access. Diversification was associated with a 35 percent increase in adequate access to iron, a 47 percent increase in adequate access to vitamin A, a 45 percent increase in adequate access to folate, and a 35 percent increase in adequate access to zinc. Interestingly, while owning livestock is associated with improvements in access to vitamin A, folate, and zinc, there is no significant association with iron, which is one of the key nutrients most easily absorbed from animal-source foods and one of the nutrients for which Malawians have high levels of deficiencies (Government of Malawi, 2009). 80 percent of household heads had some formal education. Formal education was positively and significantly associated with all the dependent variables: HDDS, MsHDDS, and four household micronutrient access indicators.

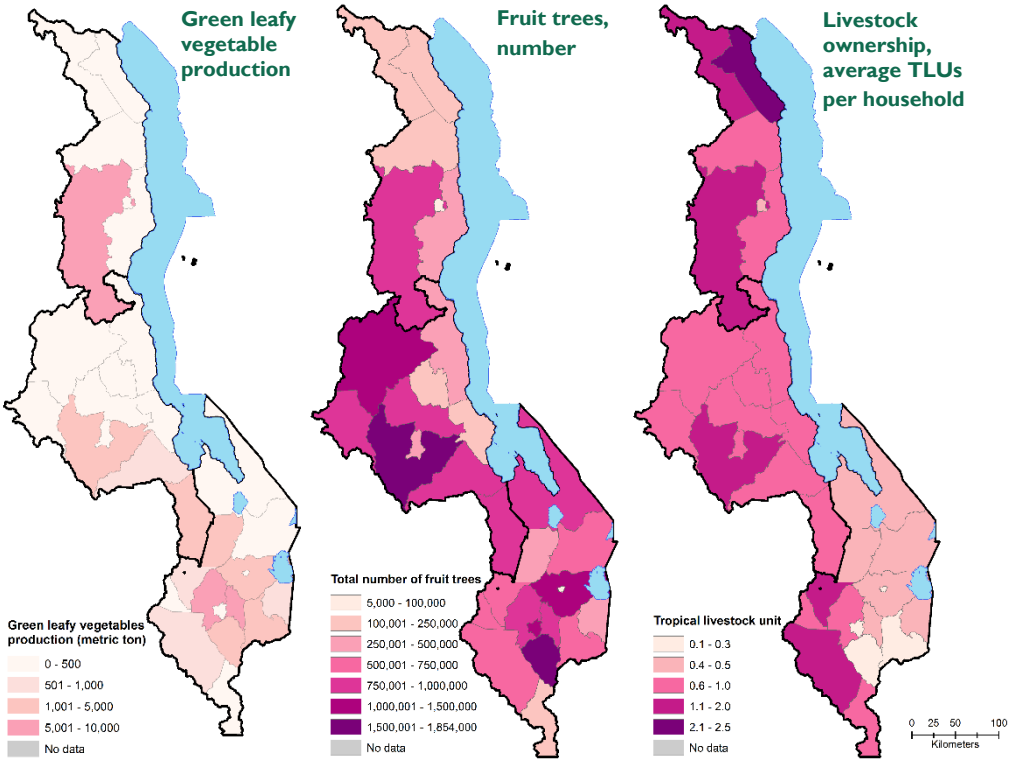
In terms of gender, results controlled for female and male-headed households. Male-headed households were slightly—1 percent—more likely to diversify production. In addition, male-headed households were associated with a 5 percent increase in HDDS and MsHDDS. The household micronutrient access scores also indicated that households headed by men were accessing higher amounts of micronutrients, except vitamin A, for which insignificant results were obtained. While this is at odds with Jones, Shrinivas, and Bezner-Kerr (2014), who found that male-headed households to be associated with a slightly lower HDDS, they also included a variable for control over agricultural income that indicated a much larger significant effect. This suggests that shared control over income between spouses may be more important than the gender of the household head alone.

5.4—Discussion

Taken together, these results indicate a tendency for farm households to practice market-oriented production diversification when land, inputs, and market access allow. However, the fact that access to credit actually *decreases* probability of production diversification suggests that market-oriented production diversification may reflect a need for cash, rather than a deliberate shift towards increased diversification for own-consumption. Furthermore, the positive association between subsidized fertilizer and production diversification may be due to a propensity for smallholders to diversify their production only after they have satisfied household requirements for maize. Sometimes referred to as *filling the maize basket*, this theory is based on the assumption that farmers who produce more maize—often due to the receipt of FISP-subsidized inputs—are in a better position in terms of their level of household food security to risk expanding the number of crops they produce to other food crops (Snapp and Fisher 2014).

Both the HDDS and MsHDDS showed a positive and significant association with production diversity, implying that when crops other than maize are grown (Figure 5.2), whether for market sale or for own consumption, this increases household food security and allows households to access a more diverse set of foods. The fact that these relationships held true across all four Household Micronutrient Access indicators is noteworthy, particularly because micronutrient deficiencies remain a major challenge in Malawi (Government of Malawi, 2009). Theoretically, it follows that the ability to diversify should improve individual nutrition outcomes. However, this hypothesis could not be tested here due to the fact that the IHS3 did not collect information on individual-level dietary intake.

Figure 5.2—Maps of district-level production in Malawi of nutrient-dense products – green leafy vegetables, fruit, and livestock



Source: Analysis by M. Kedir, IFPRI, of IHS3 data.

With respect to gender, our results showed that male-headed households were more likely to be food secure and have access to more diverse foods. There is strong evidence highlighting the food insecurity challenges faced by women, who are often more constrained than men in terms of access to credit, land, extension services, and other productive resources (Alkire et al. 2012). As such, female-headed households often operate at a disadvantage relative to male-headed ones, which has adverse food security and nutrition implications for all household members.

In addition to addressing constraints of female-headed households, the extent to which women have control over agricultural income, regardless of household head, is a critical part of improving food security outcomes. These findings support the call to better incorporate gender considerations into agriculture-based programming, captured in the pathway on "Agriculture as a way to affect women's decisionmaking power" mentioned in Chapter 1.

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