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Maize Consumption Estimation and Dietary Diversity Assessment Methods in Malawi

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Food security in Malawi is generally equated with adequate maize production, the country's main staple crop, which accounts for more than 60 percent of total food production. However, reliable estimates of maize consumption are also useful measures for assessing food security. Further, information on the level of dietary diversity in the country can be used by policymakers and program managers to evaluate progress towards nutrition goals. This policy brief is based on a triangulation exercise evaluating alternative data sources for estimating maize availability and consumption as proxy measures of food security in Malawi. Data sources used for the comparison estimates include the Integrated Household Survey, the Food and Agriculture Organization's Food Balance Sheets, and documentation from the Malawi office of the World Food Programme (WFP) and the Malawi Vulnerability Assessment Committee. The brief also examines how best to use information from the country's second Integrated Household Survey to assess the level of dietary diversity in Malawi as a measure of nutrition security. Comparative statistics are applied to assess the reliability and accuracy of available production, consumption, and dietary diversity data, with particular emphasis on maize.

Estimating Malawi's Maize Production and Consumption

Malawi's maize consumption was calculated by Ecker & Qaim from the second Integrated Household Survey (IHS-2) to account for 45 percent of total food quantity, 60 percent of energy, and 48 percent of protein consumption. Their estimate of per capita maize consumption is 382 grams. Such estimates from the IHS-2, since it is a nationally representative survey, can be used to calculate the country's total annual maize consumption. However, as the IHS is carried out only every 5 to 6 years, the validity of maize consumption estimates drawn from these surveys depends on the representativeness of the year in which the survey was conducted. Even though the enumeration period for the IHS-2 was March 2004-March 2005 (i.e. before 2004/05 maize harvest), the maize consumption referenced in the survey was from the 2002/03 and 2003/04 production years. In both years national production barely covered or only slightly exceeded requirements for human consumption. However, by November 2004, Famine Early Warning Systems Network reported that food aid distributions were already underway in some parts of the country. Between December 2004 and the 2005 maize harvest, the reports document an increasingly worsening food security situation. By May 2005, the Malawi Vulnerability Assessment (MVAC) concluded that between 4.2 million and 4.6 million people require food aid for the 2004/05 agricultural season. Projections of maize consumption for other years based on the Ecker & Qaim consumption figure may therefore be underestimating the true expected per capita maize consumption, since consumption during the 2004/5 season may have been suppressed.

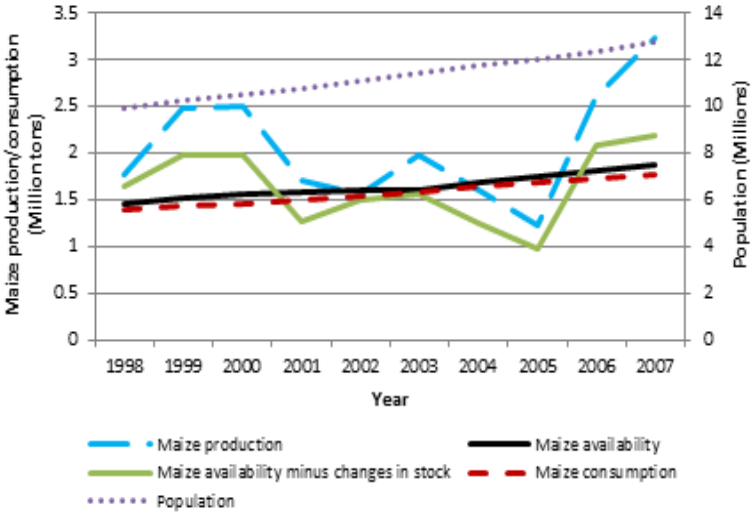
Computed annual consumption data is plotted in Figure 1 for the period 1998 to 2007. The increases in national consumption over time are driven by population increases independent of fluctuations in production or availability.

The total annual maize consumption estimates based on IHS-2 data can be directly compared with the Food and Agriculture Organization's (FAO) consumption and availability estimates. FAO's Food Balance Sheet (FBS) is designed to present a comprehensive picture of the country's food supply situation during a specified reference period, accounting for the supply and utilization of each item in a reference food basket. Supply of food is calculated by adding the total quantity

produced to the total imported, adjusting for any change in stocks. It should be noted that FAO does not collects production data itself, but rather uses data that are produced annually by different institutions in the representative country (FAO, 2001).

The difference between the FAO approach to calculating maize consumption and the Ecker & Qaim approach is that the FAO estimate is based on maize available, while

Figure 1: Maize Production, Maize Consumption, and Population Growth



Source: Maize production and availability from FAO production database, maize consumption from FAO Food Balance Sheet and IHS, population based on intercensal population growth rate 1998–2008.

Ecker & Qaim estimate consumption directly from food consumption recall data. Both approaches have their merits and shortcomings. While IHS recall data may not be representative across years, the FAO approach is less direct and depends on a greater number of assumptions.

Malawi's annual maize production has fluctuated over the last twelve years, with average production of 2.16 million metric tonnes, but with considerably higher production in recent years (Figure 1). According to FAO, per capita maize consumption has remained fairly constant over the years except for the 2001/02 and 2004/05 agriculture seasons, when the country experienced particularly poor maize harvests due to drought. At the time that the IHS-2 was carried out between 2004 and 2005, FAO estimated a daily per capita maize consumption of 353 grams, which is 29 grams lower than Ecker & Qaim's estimate over the same period. The difference may be explained by the fact that FAO uses a higher population figure in their calculation for daily maize consumption compared to our estimation based on the National Statistical Office's (NSO) 1998 and 2008 population census data. Aggregated, this represents a difference of 135 thousand tons of consumed maize between the two consumption estimates.

Using the Ecker & Qaim estimation method, national maize consumption was approximately 1.79 million tons, which suggests that the country was already short in maize at the end of 2004 or beginning of 2005 when compared to the maize production estimate of 1.61 million tons in 2004 from the Agricultural Production Estimate Survey (APES) of the Ministry of Agriculture. This situation was further aggravated in 2005 when national maize production dropped to 1.22 million tons.

Nevertheless, both the FAO and IHS-2 derived consumption estimates show the same trend and are relatively robust against the high maize production volatility. This is the case in spite of expectations that an increase in maize production should translate into an increase in maize available for human consumption.

An analysis of the different elements making up the FBS indicates that stock variation has an important influence on maize availability. Changes in maize stocks absorb most of the fluctuations, as can be seen from the estimate for maize availability in the absence of changes in stocks (Figure 1). In principle, stock estimates should be comprised of changes in government stocks, commercial stocks, and stocks on farms. In practice, available information most often relates only to stocks held by government, and even this is not always available FAO's handbook on the construction of FBSs notes that stocks are the component for which it is most difficult to get reliable and accurate data. Given the information limitations for Malawi, we recommend that FAO use a similar approach to that used by Ecker and Qaim to estimate the amount of maize that is available for consumption, given the fact that comprehensive, accurate, and reliable stock-holding data is not available.

Dietary Diversity

In addition to sufficient dietary energy measured in calories, a healthy diet is necessary for normal physical and mental development. Such a diet is one that is diversified and well-balanced over the main food groups (starchy staples, non-starchy vegetables, fruits, animal products, fats and oils, and legumes and nuts) and contains sufficient levels of essential proteins, vitamins, and minerals.

Malawi uses a six food group model of a healthy diet to help diversify diets and inform consumers. Based on this model and recommendations from WFP, a Malawian adult needs daily to consume approximately 2,100 kilocalories consisting of 38 percent starchy staples, 35 percent legumes and nuts, 13 percent fats and oils, 6 percent fruits, 4 percent non-starchy vegetables, and 4 percent animal foods. According to Ecker & Qaim, food consumption in most Malawian households is poorly diversified. On average, more than 60 percent of the total food consumed consists of starchy staple foods, primarily maize. In Malawi maize, in addition to be the most important carbohydrate source is also the source for 67 percent of total iron, 65 percent of total zinc, and almost 70 percent of total riboflavin consumed.

Estimates from MVAC and IHS-2 are used to evaluate Malawi's dietary diversity against WFP's recommendations. The MVAC assessment identifies parts of the country that have significant portions of the population at risk and vulnerable to hunger and food insecurity. The risk of hunger is expressed as a missing food entitlement (MFE) (MVAC, 2005). MFE's can be converted into any commodity, or a basket of commodities. The MVAC expresses MFE's as a share of the minimum daily food energy requirement of 2,100 kcal. For the IHS-2, the food consumption module from the survey provides data for dietary diversity analysis. Calorie recommendation and requirements are computed by applying recommended mean energy intakes, (FAO, 2004). Calorie recommendations for all individuals are defined as average requirements necessary to maintain a normal lifestyle with moderate physical activity level and a medium body mass index of 21.0 kg/m^2 among adults.

Table 1 confirms that diets in Malawi are poorly diversified with starchy staples dominating the share of calorie intake within each food group. Except for starchy staples and fats, calorie consumption from the food groups is fairly consistent between the MVAC, which represents vulnerable areas and IHS-2, which was undertaken in a poor agricultural season. When compared to WFP's targets, the dominance of maize in the diet presents significant nutritional challenges, which include low levels of consumption of fruits, non-starchy vegetables, animal foods, and beans and nuts (Table 1). While the 2011 MVAC and 2004-05 IHS-2 were conducted a few years apart, estimates based on IHS-2 are nationally representative, whereas the MVAC estimates only represent those areas of low food security.

Table 1: Share of Different Food Groups in Total Calorie Intake (%)

Food Type	WFP (Target)	IHS-2 2004-2005	MVAC (2011)
Fruits	6	2	1
Vegetables	4	1	0
Beans and nuts	35	11	11
Animal foods	4	3	1
Fats	13	10	1
Starchy staples	38	73	85
Total	100	100	100

Data sources: WFP, Ecker & Qaim, and MVAC

Conclusion and policy recommendations

Reliable data are vital for policy planning and analysis; accordingly, understanding the validity of existing indicators is important. The analysis presented above indicates that the maize consumption estimates based on IHS-2 and FAO data are consistent with one another. However, in order to assess how production may impact consumption it is recommended that the IHS consumption analysis should be repeated using data from the IHS-3 (2009/10 agricultural season), which was a year marked by national surplus production. We find that consumption estimates derived from the FAO production data are robust against highly volatile fluctuations in annual maize production only when changes in stocks are taken into account in the food balance sheet calculation. For a better understanding of the role that stock variation plays in maize availability and to validate other components of FAO's food balance sheet, studies are needed that provide comprehensive and reliable estimates of Malawi's stock holding levels.

The challenge for Malawi in improving dietary diversity is to reduce the dominance of starchy staples while increasing intake of pulses, fats, fruits, and non-starchy vegetables. While the Integrated Household Surveys are nationally representative and provide a detailed picture of food consumption and dietary diversity of Malawi's population, the IHS-2 was carried out at a time of low agricultural productivity and likely to have had a negative impact on maize consumption and dietary diversity. A comparison of dietary diversity between the IHS-2 and IHS-3 should provide important insights into the country's dietary situation following the period of good agricultural seasons in the years following the IHS-2 survey. Additionally, the Food Variety Score (FVS)

and the Dietary Diversity Score (DDS) can also be used to measure dietary diversity in years falling in between IHSs. FVS and DDS are easily calculated from a detailed food consumption section of household budget surveys by counting different food items and food groups consumed, respectively. FVS and DDS have been found to be useful first-cut indicators for assessing household food security and dietary diversity. Therefore, it is recommended to compute these scores from any new appropriate data set as a routine matter and integrate them into a monitoring system that assesses progress toward the country's dietary targets. Due to the cross-cutting nature of nutrition and its national importance, the inclusion of simple questions capturing information about dietary diversity should be considered in all, or at least most, of the surveys that are carried out in Malawi on a regular basis. These may include the Welfare Monitoring Survey, the Population and Housing Survey, the Demographic and Health Survey, and the Multiple Indicator Cluster Survey.

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The Malawi Strategy Support Program of the International Food Policy Research Institute (IFPRI) works closely with the government of Malawi and other development partners to provide information relevant for the design and implementation of Malawi's agricultural and rural development strategies.

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