Centro Internacional de Agricultura Tropical
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InfoNote

Household Food Security:

Project results for "His and Hers, time and income: how intra-household dynamics impact nutrition in agricultural households"

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Introduction

Reducing hunger constitutes one of the Sustainable Development Goals (SDGs). This problem goes beyond lack of income, therefore, it must be approached from a multidimensional perspective. In particular, hunger in a person or household is the result of a lack of food security. According to Swindale and Billinsky (2006), USAID defines food security as a situation where "*there is both physical and economic access, at all times, to sufficient food to meet dietary needs for a productive and healthy life (pp. 1)".* This consists of three components: availability (refers to having adequate food available and in adequate quantities), access (a measure of the capacity to obtain adequate and sufficient food to maintain proper nutrition) and utilization (a measure of whether the population uses food properly, that is, manages food in a way that allows them to receive the necessary nutrition) (Swindale & Bilinsky, 2006). Thus, to develop and validate appropriate food security measures and to monitor the changes of the different interventions it is of great importance to quantify the effectiveness of interventions.

This Info Note considers three metrics widely used in development projects due to their ease of implementation: Household Dietery Diversity Score (HDDS), Months of Adequate Household Food Provisioning (MAHFP) and Household Food Insecurity Access Scale (HFIAS), which act to principally evaluate the component of access in households. The metrics are applied to a sample of Guatemalan agricultural households. This application is framed within the project "His and Hers, time and income: How intra-household dynamics impact nutrition in agricultural households," led by the International Center for Tropical Agriculture (CIAT) and the University of Florida [1] with funding from the program Innovative Methods and Metrics for Agriculture and Nutrition Actions (IMMANA).[2]

Methodology

In this study, we interviewed 250 households with couples making decisions. The sample is equally distributed in two study sites in Guatemala: one site in the East, where the population is principally *mestizo,* and one site in the West where there is a strong indigenous influence. In addition, our households are mostly, small coffee producers and beneficiaries of the "Agricultura, Suelo y Agua (ASA)" project implemented by Catholic Relief Services (CRS).

Household Dietary Diversity Score (HDDS)

Evidence has been found that dietary diversity in the home is strongly associated with consumption per capita (a proxy for income) and available energy, suggesting that dietary diversity could be a useful indicator of household food security (Hoddinott & Yohannes, 2002; Ruel, 2002; Kennedy et al., 2013). The Household Dietary Diversity Score (HDDS) was developed within the framework of the Food and Nutrition Technical Assistance (FANTA) project to measure household dietary diversity as a proxy for *access to food* in the home, that is to say, it is an indirect measure of the economic ability of a household to access a variety of foods (Swindale & Bilinsky, 2006; Kennedy et al., 2013). The indicator measures diversity as the number of food groups consumed in the home in the 24 hours prior to the survey.

In the context of the project "*His and Hers, time and income: How intra-household dynamics impact nutrition in agricultural households,"* HDDS data was collected using a predefined list of common foods consumed in Guatemala and grouping them according to HDDS food groups. This list was made up of 79 food items [3] .The basis for the selected foods can be found in the "Survey to evaluate the impact of the PLAN HAMBRE CERO" for Guatemala in 2012. For each food, it was asked if the household had consumed the food in the previous day (that is, 24 hours prior to the survey). The interviewee had to answer in the affirmative (1-Yes) or negative (0-No). Subsequently, each product on the list was categorized according to the food groups established by the HDDS.[4] Once it is established whether the household consumed food from a food group, the indicator is specified as follows.[5]

(1) Total number of food groups consumed by family members.

$$\text{HDDS(0-12)} = \sum_{i=1}^{12} Group_i$$

Where i represents each food group.

(2) Average HDDS indicator.

$$\text{HDDS average} = \frac{sum\ (HDDS)}{Total\ number\ of\ households}$$

[1] More information about the project can be read at https://doi.org/10.7910/DVN/BP23OB

[2] IMMANA is funded with UK aid from the UK government.

[3] The category 'other' was added to this list for those foods that were not in the base list, but had been consumed by the household the previous day.

[4] The following set of 12 food groups is used to calculate the HDDS: A. Cereals; B. Root and tubers; C. Vegetables; D. Fruits; E. Meat, poultry, offal; F. Eggs; G. Fish and seafood; H. Pulses/legumes/nuts; I. Milk and milk products; J. Oil/fats; K. Sugar/honey and L. Miscellaneous.

[5] For more details about the methodology for estimating this index, see Swindale, A. & Bilinsky, P. (2006).

Months of Adequate Household Food Provisioning (MAHFP)

The second index used corresponds to Months of Adequate Household Food Provisioning (MAHFP); according to Bilinsky & Swindale (2010), access to food for households refers to their capacity to obtain food from different sources whether that is their own production, purchases, subsidies, donations, gifts, etc. This also depends on the economic resources available to the household. Given that throughout the year resources and sources from where food is obtained can vary (e.g. a bad harvest, loss of employment of a household member that reduces economic resources, natural disasters, etc.), households can have months where they do not meet their food needs. In that sense, the Months of Adequate Household Food Provisioning (MAHFP) is an indicator of the impact of access to food that allows for the capturing of changes in a household's ability to have provisions during the year. It also identifies the direst months for having provisions and when the households would need more help. The calculation of the indicator corresponds to the difference between the 12 months of the year and the number of months that the household could not meet food needs (equation 3). Later, an average is calculated for all households that participated in the sample (equation 4) (Bilinsky & Swindale (2010)).

$$\text{MAHFPS(0-12)} = 12 - \sum_{j=1}^{12} Month_i$$

Where j represents each month.

(4). Average MAHFP for the population sample.

$$\text{MAHFP average} = \frac{\sum_{s=1}^{n} MAHFP_s}{Total\ number\ of\ households}$$

Where s represents each household and n the number of households in the sample.

The Household Food Insecurity Access Scale (HFIAS)

The Household Food Insecurity Access Scale indicator (HFIAS)[6] measures household food insecurity (access). This indicator was developed by USAID's FANTA project and it is useful for identifying where to focus a program or analyze impact that activities of a given program may have on the participating population. However this indicator does not allow for the identification of causal relationships. According to Coates, Swindale y Bilinsky (2007), the indicator is made up of two types of questions. The first type is called an *occurrence questions,* which inquires if a condition or situation associated with food insecurity during the last four weeks (30 days). Each one of these questions is followed by a *frequency of occurrence* question that asks how frequently the situation or condition occurred during the last four weeks. Four types of indicators can be calculated for better understanding of the characteristics in terms of food insecurity in the surveyed population.

1- HFIA-related Conditions: Using the nine *occurrence* questions, this indicador provide information about the behaviors and perceptions of the surveyed households

$$\%\ household\ experiencing\ a\ condition = \frac{number\ households\ with\ response\ "yes"\ to\ a\ specific\ occurrence\ question}{Total\ number\ of\ households\ responding\ to\ the\ question} \text{ x } 100$$

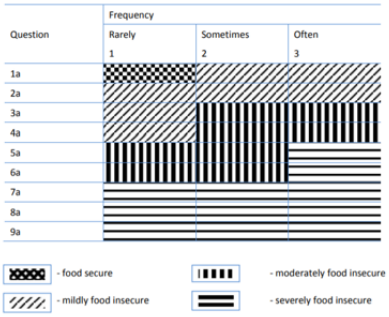
2- HFIA-related Domains: To provide summary information on the prevalence of households experiencing one or more behaviors the occurrence questions can be summarized into three different domains of food insecurity (in terms of access):
   a) Anxiety and uncertainty about the household food supply (q1-Worry about food)
   b) Insufficient food quality and insufficient food intake (q2-Unable to eat preferred foods, q3-Eat just a few kinds of foods, q4-Eat foods they really do not want eat,)
   c) Their physical consequences (q5-Eat a smaller meal, q6-Eat fewer meals in a day, q7-No food of any kind in the household, q8-Go to sleep hungry, q9-Go a whole day and night without eating).

$$\%\ household\ experiencing\ a\ condition\ in\ each\ domain = \frac{number\ households\ with\ response\ "yes"\ to\ any\ of\ the\ conditions\ in\ a\ specific\ domain}{Total\ number\ of\ households\ responding\ to\ the\ questions\ in\ the\ domain} \text{ x } 100$$

3- HFIA-related score: This indicator informs about the degree of food insecurity (access) in the household in the past four weeks (30 days). The lower the score, the less food insecurity a household experienced.

$$HFIAS\ Score\ (0-27) = sum\ of\ the\ frequency\ \ for\ the\ 9\ food\ insecurity\ related\ conditions\ questions$$

4- Household Food Insecurity Access Prevalence: The final indicator is based on classifying households into 4 groups – food secure, mildly food insecure, moderately food insecure, and severly food insecure - based on frequency of occurrence questions. The following scheme shows how the categories was defined.



Source: Coates, Swindale y Bilinsky, 2007

[6] For more detailed information about the indicator and its implementation refer to Coates, Swindale y Bilinsky, 2007.

Results

Household Dietary Diversity Score (HDDS)

The HDDS is an indicator that counts the number of average food groups consumed by households in a population. Therefore, its value varies between 1 and 12. As the value approaches closer to 12, it implies a more diverse diet.

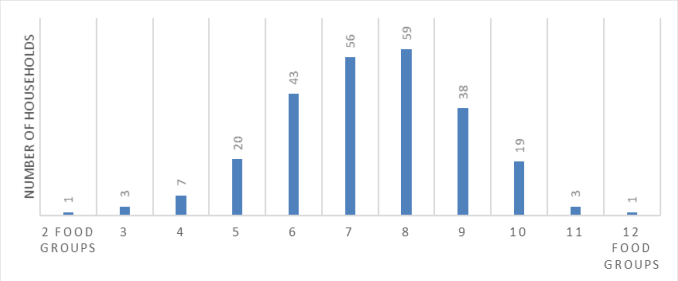
Table 1. HDDS average by study site.

Study site (zone)	N	Average	ttest
East	125	7.128	0.0322
West	125	7.576	
Total	250	7.352	

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Table 1 shows that the study population consumes 7.4 food groups on average. When broken down by study site, the reported average in the East is slightly lower than the West, 7.1 and 7.6 respectively, with the differences by zone being statistically significant. Figure 1 presents the number of households according to the number of food groups that they consume.

Figure 1. Frequency of households by number of food groups consumed.

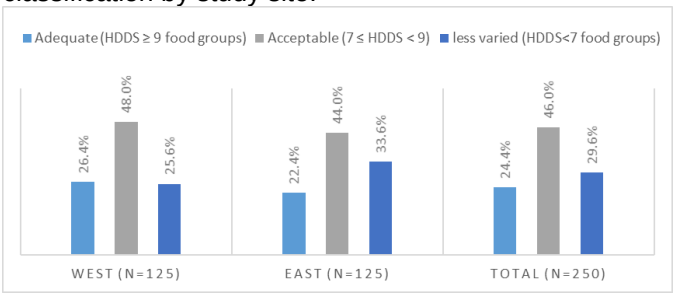


Even though the indicator shows us the average number of food groups consumed in the population, it does not tell us anything about the adequacy of the value obtained. Therefore, to classify households according to the adequacy of the HDDS, we use the average diversity value (HDDS) of the top two highest tercile groups based on their dietary diversity scores (Carbajal, 2014). The average of the top tercile (the 33 percent of household with the highest diversity) is used as the "adequate" diversity group, and the average of the second tercile is used as the "acceptable" group; leading to the following categories.

- Adequate: HDDS ≥ 9
- Acceptable: 7 ≤ HDDS < 9
- Little variety: HDDS<7

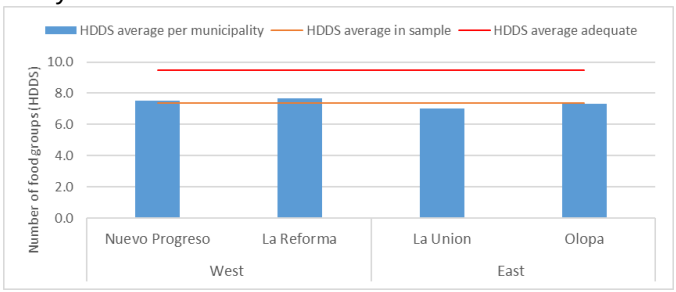
Accordingly, 46% of the households interviewed have an acceptable HDDS. On the other hand, 29.6% of households showed a diet with little variety during the reference period and 24.4% presented an adequate HDDS. When broken down by study site, the results showed that in the East there are 8% more households with a less diversified diet than in the West (Figure 2)

Figure 2. Percentage of households according to HDDS classification by study site.



When the information in the sample is broken down to the municipal level, it confirms the condition of the East, since the municipalities in the East, la Unión and Olopa, have a lower HDDS not only to the average general population but also of the municipalities studied in the West (Figure 3). It should be noted that, in Guatemala, the diversity between the East and the West of the country is well-known, not only in biophysical terms but also socio-economic and cultural terms -- hence the categorization by study site. One of the reasons why the diversity indicator has a lower performance in the East of the country is because this zone forms part of the country's "Dry Corridor". The area is generally considered one of the warmest and driest regions in Guatemala. Therefore, one is more likely to encounter conditions here that affect the availability of food.

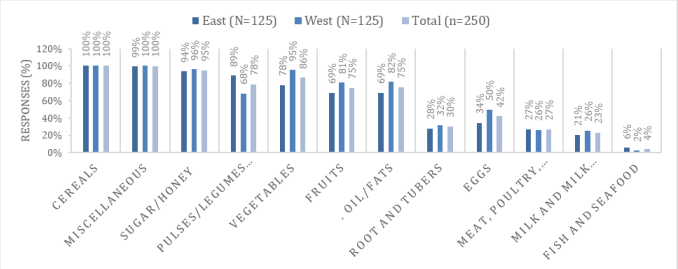
Figure 3. Dietary Diversity Score by municipality and study site



However, when the information is analyzed according to the frequency of responses for each food group, 100% of the households interviewed consumed foods in the cereals and miscellaneous food groups (in this group are foods such as instant soups or soups in pouches, sauces, spices, salt and coffee, among others) the day before the

interview. Those groups were followed by sugars, legumes, and vegetables. Dairy products, fish, and seafood were the least consumed groups. The results from the food groups used suggest a poor nutrient profile that may not meet nutritional requirements of the households (Figure 4).

Figure 4. Consumption of food groups by study site and total (percetage of response).



Months of Adequate Household Food Provisioning (MAHFP)

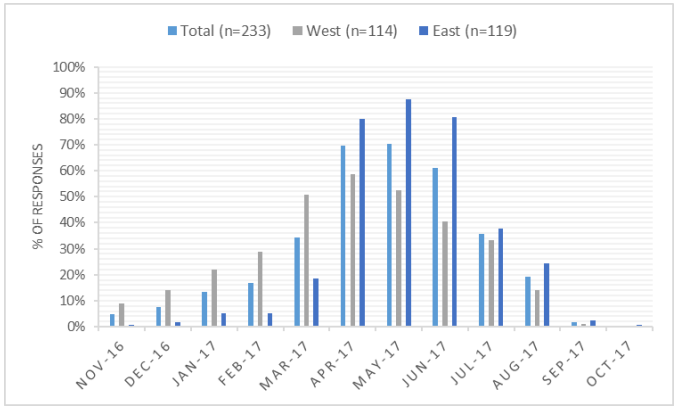
The results of the MAHFP indicator suggest that in the last 12 months 93.2% of households interviewed had at least one month in which there was not enough food to satisfy the family's needs. The remaining 6.8% reported that there was no type of difficulty in any month. When broken down by zone, in the West 91.2% of households showed problems in some month. The figure is slightly worse in the East with 95.2%. The MAHFP shows the average number of months in which a household has an adequate supply of food. Specifically, it is 12 minus the total number of months that the household could not meet their food needs (Bilinsky and Swindale, 2010). For the reference period, households in the West, on average, had 9 months with normal food access to meet their needs (this means that there were 3 months of inadequate food). The average was 8.8 months in the East. The average for the total sample was 8.9 months. In general, mean-comparison test indicates that there are no significant differences in the average months of adequate food supply between the East and the West (Table 2).

Table 2. MAHFP average by study site.

Variable	Obs	Mean	Std. Dev.	Min	Max
Total	250	8.88	1.608711	3	12
West	125	9.04	1.705778	3	12
East	125	8.72	1.495153	5	12

Figure 5 shows the frequency of responses for each month in which there were food provision difficulties in the households interviewed during the reference period. In general, the most critical months are concentrated in April, May and June. When divided by zones, the trend remains, however in the case of the West, March is added as a critical month for 51 percent of households. Considering the agricultural calendar of Guatemala (MAGA, 2015), these results are consistent with the beginning of the planting season of basic grains (such as beans and maize) wich are the main sources of food for peasant households in Guatemala. It was therefore to be expected that March to June (depending on the area) are the months with higest food shortage in the households. On the other hand, in lowlnads the coffee harvest starts from October to November, and highlands it occurs between from December to January. In consequence during this period households showed the lowest frequency of food shortage.

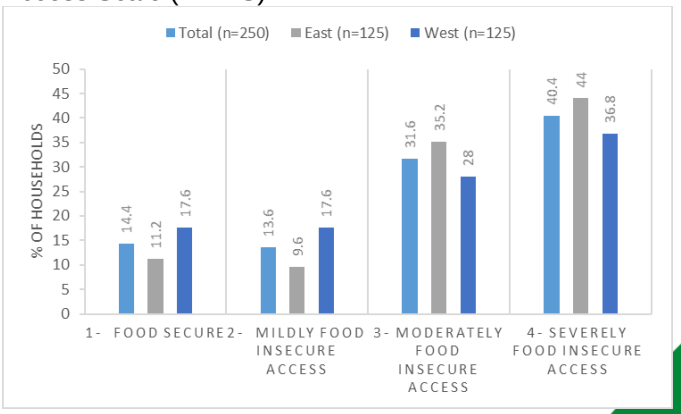
Figure 5. Percentage of households that had shortages in a specific month.



The Household Food Insecurity Access Scale (HFIAS)

The Household Food Insecurity Access Scale Score (HFIAS) considers not only occurrence questions but also frequency-of-occurrence questions to measure the degree of household food insecurity. Overall, results of this indicator show that almost three-quarters of the households (72%) experience moderate or severe food insecurity in the month prior to the survey (categories 3 and 4 in Figure 6). Furthermore, the eastern site has higher rates of moderate and severe food insecurity than the western site.

Figure 6. Prevalence of Household Food Insecurity Access Scale (HFIAS).



The nine occurrence questions included in the HFIAS yields information and helps to understand the characteristics in household food insecurity in a surveyed population (Coates et al., 2007). In terms of occurrence, Table 3 shows a high percentage of the households gave affirmative responses to worrying about food (83%), inability to eat preferred food (74%) and eating just a few kinds (limited variety) of food (65%). We find that the proportions are statistically different beetwen study sites for five of the nine indicators (questions 2 to 6 in Table 3). Furthermore, The HFIAS occurrence questions can be summarized into three major domains: i) Anxiety and uncertainty about the household food supply (question 1), ii) Insufficient Quality (includes variety and preferences of the type of food, questions 2-4) and iii) Insufficient food intake and its physical consequences (questions 5-9). The results indicate that 83% of households experience anxiety and uncertainty about household food supply (domain 1); 81% of surveyed households experienced insufficient food quality in the last 30 days prior to the survey (as indicated by at least one affirmative response to the indicator questions in domain 2), and 62% had insufficient food intake (at least one affirmative response to the indicator questions in domain 3).

Table 3. Percent of households with affirmative responses to the HFIAS questions during last 30 days

Questions	Total (n=250)	East (n=125)	West (n=125)
1-Worry about food	83%	86%	81%
2-Unable to eat preferred foods	74%***	81%	66%
3-Eat just a few kinds of foods	65%***	74%	56%
4-Eat foods they really do not want eat	60%*	65%	54%
5-Eat a smaller meal	60%**	66%	54%
6-Eat fewer meals in a day	37%**	45%	30%
7-No food of any kind in the household	22%	24%	21%
8-Go to sleep hungry	20%	22%	19%
9-Go a whole day and night without eating	5%	5%	5%

Tests of proportions for statistical differences * p < 0.10, ** p < 0.05, *** p < 0.01

Discusion

Although food security is a complex definition, these results address important issues related to household food insecurity: i) characterization of food security status of households surveyed using HFIAS score ii) identify months where households are more vulnerable to food insecurity using Months of Adequate Household Food Provisioning (MAHFP) and iii) Household Dietary Diversity Score as a proxy measure food security and quality of the diet (Ruel, 2003).

Table 4 provides a comparison across the 3 indicators and suggests that households that are categoriezed as severely food insecure ate less food groups (i.e. have a lower average HDDS) and also experience fewer months of adequate food (i.e. lower average MAHFP) than food secure households.

Table 4. Comparison across the indicators

HFIAS category	MAHFP average	HDDS average
1- Food Secure	9.7	7.81
2- Mildly Food Insecure Access	9.5	7.38
3- Moderately Food Insecure Access	8.8	7.59
4- Severely Food Insecure Access	8.5	6.99

The next steps in the data analysis of the project are to explore associations between these food security indicators and other variables such as the size of the household, and food expenses in the household or income proxies. We will also examine anthropometric measures of household members and the types of food groups eaten by more and less food insecure households. These further types of analyses will allow us to identify across households the different drivers of being in any of the food insecure categories and to better understanding how intra-household dynamics relate to food security indicators of household access.

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