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Critical Examination of Two Famine Early Warning Methodologies in Zimbabwe: What Lessons May Be Learned?

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A Critical Examination of Two Famine Early Warning Methodologies in Zimbabwe: What Lessons May be Learned?

By William G. Moseley and B. Ikubolajeh Logan

This paper assesses the conceptual and practical validity of two famine early warning systems in Zimbabwe, the Save the Children Fund - United Kingdom's (SCF-UK) household food economy approach and the United States Agency for International Development Famine Early Warning System's (USAID FEWS) maize equivalency approach. This broad objective is couched in terms of two research questions: 1) How do the SCF-UK's household food economy and FEWS' maize equivalency approaches compare to the 'older' early warning methodologies? 2) What are the key components of rural food economies in Zimbabwe and how relevant is the conceptual logic of each early warning system in this empirical context?

Major Characteristics of Food Systems and Food Security in Zimbabwe

A famine early warning system is useful only to the extent that it addresses the peculiarities of a specific context. Our fieldwork suggests that the three defining characteristics of Zimbabwean food security are: spatial differences in agroecology and market infrastructure, land tenure, and high levels of food purchase and wage labour (Earl and Moseley 1996). Zimbabwe normally produces enough grain domestically to satisfy national needs. The national food balance disguises considerable variation in food insecurity or vulnerability between different regions and between wealth strata in any given region.

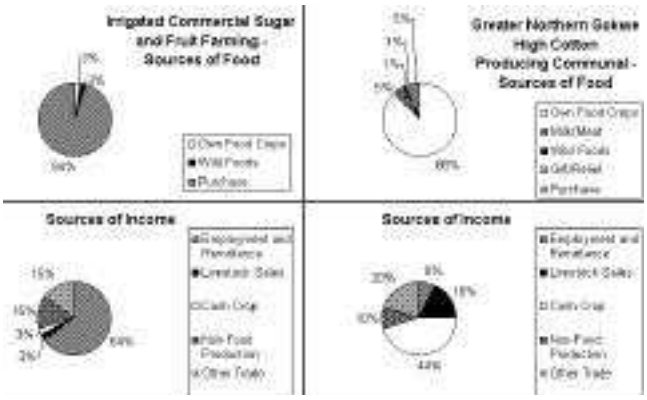
Agroecology, Market Infrastructure, and Land Tenure

Food security in Zimbabwe is often related to major ecological zones (the highvelt, middlevelt, and lowvelt), the degree of market infrastructure, and land tenure. The highvelt (or high plain) contains the most productive farmland in the country, and has more and better quality roads. Most productive land, and half of all land in the country, is owned by the white minority in a land tenure system left over from colonial times. In contrast, the lowvelt (or low plain) is semi-arid, less productive, and has a less developed network of roads and markets. The indigenous, rural population resides in the lowveltand middlevelt, which are also more prone to drought. Based on these differences in agroecology and market infrastructure (which influence prices), as well as differences between areas in household strategies to acquire food and income (which influence the sensitivity of a food system to various types of shocks), Earl and Moseley (1996) divided up Zimbabwe into 25 food economy zones, or homogeneous production zones, encompassing the the Zimbabwean rural population (roughly 7,783,000 people, or 75% of the total population, in 1996). The disparate land tenure in Zimbabwe (e.g., communal vs. commercial) means that many zones are not contiguous. Famine early warning and hunger would be less of issue if land were more equally distributed.

Food Purchase and Wage Labor

Many households in Zimbabwe are not able to grow all of their own food. On average, a rural Zimbabwean household purchases 33% of its food in a normal year. The importance of food purchases varies regionally in the rural areas: typical households on the commercial farms buy 90-100% of their food, whereas typical households in the region of Gokwe purchase 0-10% of their food on average. The graphic below depicts these vastly different levels of food purchases and the sources of income used to make them.

Sources of Cash and Income for Typical Households in Two Different Zimbabwean Food Economy Zone



The large amount of food purchase in the country makes both the price of maize meal (the staple food) and cash income very important food security monitoring variables. Wage labor is quite common: Zimbabwe's approximately 2 million permanent farm workers (i.e., workers who reside permanently on large commercial farms) generate most of their income from wages (and purchase most of their food). Among small-hold farming households the man often works in the city and the woman runs the farm. Cash is also earned by working seasonally on commercial farms, working for wealthier neighbors, or working in South Africa. Livestock sales and various forms of small enterprise are other sources of income.

Developments in Famine Early Warning

At the 1974 World Food Conference, UN agencies and donors recognized a need to establish information systems which would monitor national food production and provide an early indication of the need for intervention (Eele 1994; Babu and Quinn 1994; Quinn and Kennedy 1994). USAID and the United Nations Food and Agriculture Organization (FAO) subsequently established systems whose methodology is called the food balance sheet approach. These systems calculated national food needs (population times per capita grain needs) and compared them to the sum of agricultural production, stocks and net imports (imports minus exports) (SADC 1998).

Work by Sen (1981) on exchange entitlements, and the unexpected Sahelian famine of the mid-1980s, demonstrated

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3. The information presented regarding the nature of food security in Zimbabwe was collected while the lead author worked for the Save the Children Fund (UK) in 1996-97 as a RiskMap Advisor based in Harare, Zimbabwe.

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flaws in the food balance sheet approach, which equates food supply with food access. In response, USAID and others developed an indicator-based approach. This approach often relies on vegetation indices to bolster production estimates and assembles government data on food supply, food access, and health. The trajectories of these indicators are analyzed over time to determine whether food security conditions are deteriorating or improving. The indicators are also often combined into a general index of vulnerability (FEWS and FSTAU 1997, FEWS 1997). This approach is still used by FEWS and others in many African countries, especially where data availability is limited.

FEWS Indicator Approach Assumptions

- Famine is the result of a process, not a catastrophic event;
- Famine has observable indicators;
- A progression of indicators reflects the degree of vulnerability to famine;
- Indicators vary between places and through time; and
- Some indicators appear early enough to permit mitigative action.

(FEWS 1997: 12)

While the indicator-based approach is an improvement over food balance sheets in that it tries to account for access, there are still concerns related to its conceptual validity, interpretation, and usefulness to policymakers. The first problem is how to weight each indicator in a composite index of vulnerability. Second, it is difficult to compare one country's composite vulnerability index to other countries that might have indices composed of different indicators with different weights. Finally, while it allows statements about relative vulnerability in different areas of a country, it can not quantify actual food deficits, making interpretation difficult for policymakers.

Two Newer Early Warning Systems in Zimbabwe

The most recent round of innovation in the famine early warning field has led to the development of methodologies that attempt both to quantify and account for variation in access at the sub-national level. Two systems that are part of this 'third wave of innovation' are operating in Zimbabwe: the FEWS maize equivalency and the SCF-UK household food economy approaches. While these systems share much in common, there are important differences in the way they assemble information and conceptualize hunger.

The FEWS maize equivalency approach operates at the national level and covers all communal areas. The SCF-UK household food economy approach has only been implemented in the Binga and Kariba districts. We applied the FEWS approach in the Manjolo Communal Area of Binga District using input information derived from Government of Zimbabwe data sources, which allowed us to compare it with the SCF-UK approach. The analysis pertains to the period from April 1996 until March 1997 (1996/97 was considered to be an above average year for crop production).

FEWS Maize Equivalency

FEWS began to use a modified income estimation or maize equivalency approach in Zimbabwe in 1996-97 due to concerns over the indicator-based approach (Eilerts and Vhurumuku 1997; FEWS and NEWU 1998). FEWS Zimbabwe assembles data from secondary sources (mainly governmental) on food production, cash income, and transfers/entitlements for sub-national units known as communal land areas, which are then converted to a common metric of per capita maize equivalents by communal area. Sources of income are converted to maize equivalents by dividing the amount of income by the price of a kilogram of maize. The sum of maize equivalents (from different sources of food and income) is then compared to a threshold value of 250 kilograms of maize per capita per annum to determine if there is a shortfall or surplus. The FEWS threshold is considerably higher than the 154 kilogram per capita per annum used by the National Early Warning Unit (NEWU) (Eilerts and Vhurumuku 1997: 2).

Maize equivalents are added sequentially, starting with what are believed to be the 'best' quality data, which are "systematically and regularly collected at the communal land level, cover a relatively long period, and are relatively free from known error and bias." (Eilerts and Vhurumuku 1997: 2). An initial maize total is calculated, and further maize equivalents based on data of 'acceptable' quality are added only for those communal areas that had a shortfall after the first step. Acceptable data are "those which relay information about important production and other income or transfer sources, are systematically collected and reasonably free from known error or bias, but which may not be provided at the level of analysis desired, or may not cover all areas, be regularly collected, or not be as recent as other data used." (Eilerts and Vhurumuku 1997: 2). Areas with a shortfall after the first two steps are then evaluated for extenuating conditions based on local knowledge or specialised data sources, to determine whether there is a genuine food shortage or whether there are other, unaccounted for, sources of food and income. The final deficit is calculated by subtracting all per capita maize equivalents (from steps one, two and three) from 250 kilograms. The difference, or per capita shortfall, is multiplied by the population of the area to derive a food deficit figure.

In the Manjolo communal area, both 'best quality' and 'acceptable quality' data were used to arrive at maize equivalents of 101 kilograms. This per capita deficit figure is then multiplied by the population of Manjolo (68,237 persons) to determine the food shortfall, 10,167 metric tonnes. FEWS officially reports the deficit without factoring in coping strategies, as it does not believe households should be required to run down their resources in order to avoid hunger.

FEWS Maize Equivalency Strengths

- Sequential data analysis starting with "best quality" data and adding lower quality as needed
- Transparency of maize equivalents aids policymakers in understanding analysis
- Attention to sources of income alleviates some food crop bias
- Allows quantification of potential grain short falls

FEWS Maize Equivalency Weaknesses

- Does not highlight disparities in food production and income between segments of population in same communal area
- Highly dependent on data quality
- Shortage in one area is not assumed to affect price or supply in neighboring areas

SCF-UK Household Food Economy Approach

The second, newer early warning system in Zimbabwe, the SCF-UK household food economy approach, is a stand-alone computer package called RiskMap (SCF-UK 1997, Seaman 1997, Seaman 2000). A baseline database for a typical year is developed, in which the country is divided into food economy zones - areas that share broadly similar livelihood patterns. For each area, research using semi-structured interviews

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with key informants outlines the relative importance of different sources of food and income, asset levels, coping strategies, and market structure in a normal year. Baseline data are registered in terms of the percentage of annual household food needs that are normally met by a particular source for a rich, modal or poor household. It is assumed that the poorest households attain enough calories to survive in normal years (1900 kcals per person per day). Annual change is measured against the baseline in order to determine vulnerability in a year, and similar calculations are undertaken for all major sources of food and income. The baseline database contains information regarding households' abilities to use coping strategies (e.g., normal levels of food stocks and cash reserves) and the order in which they are typically employed. The analyst can model typical coping strategies, and exclude some that are not viable in a particular year from the deficit calculations.

The SCF-UK household food economy approach was also tested in the Manjolo communal area, which intersects with four of SCF-UK's food economy zones. Manjolo's population is split between these zones as follows: Lake Kariba Agro-Fishers (20% of Manjolo population), Poor Resource Kariba Valley (45%), Kariangwe (25%), and Lusulu (10%). These areas were evaluated separately, as SCF-UK field surveys indicated that the sources of food and income and their relative importance to household food security are significantly different. Using the same government statistics as FEWS, potential food deficits are determined for each zone and wealth group, and then combined to derive the deficit for the Manjolo area. The current situation is known in some instances (e.g., food crops) and not in others (e.g., remittances). In this comparative analysis we have assumed the situation was normal for employment, remittances and other non-farm income. Ideally a survey would determine current levels of these variables. Mean deficits (i.e., all income groups combined) for each of the four areas were: 2% for Lake Kariba Agro-Fishers, 4% for Poor Resource Kariba Valley, 6% for Kariangwe, and 0% for Lusulu. These deficits are calculated assuming that no coping strategies would be employed. As a result, the average food deficit for Manjolo communal area was 3.7% of requirements (a weighted average based on population proportions). Food needed to cover this deficit would either be 545.4 metric tonnes using the SCF-UK average per capita annual maize requirement of 216 kilograms, or 631.2 metric tonnes if the FEWS requirement of 250 kilograms is used.

SCF-UK Household Food Economy Approach Strengths

- Incorporates socioeconomic data into analysis (particularly important where income and food production vary substantially between households)
- Food economy areas more homogenous in terms of livelihood strategy - reduce potential to overlook vulnerable groups
- Use of "normal year" baseline proportions shows relative importance of source of income or food in comparison with others to a particular group

SCF-UK Household Food Economy Approach Weaknesses

- Assumption that even the poorest households receive enough calories in normal years can overlook chronic malnutrition
- Concept of "normal year" less useful in areas where climate is erratic
- Model does not take into account dynamic coping strategies which may permanently alter the way a household procures food
- Food economy areas do not necessarily correspond with administrative boundaries, and may create aid administration problems
- Food economy areas do not interact in grain markets, which are assumed to be local

Explaining the Divergent Results

Our analysis showed that when the two methods were applied in the same area of the country, they produce drastically different deficit predictions. The SCF-UK household food economy approach predicted a deficit of 545.4 to 631.2 metric tonnes of maize for Manjolo, compared with the 10,167 metric tonne deficit using the FEWS maize equivalency methodology. Differences may be attributable to two factors: use of data sources, and conceptual modelling of food security systems.

Use of Government Statistics and Survey Data

The FEWS maize equivalency and SCF-UK household food economy approaches employ government statistics and household survey data differently. According to government sources, Manjolo farmers had an average grain harvest of 41 kilograms per capita in 1996/97. FEWS equates this figure to 16% of annual food requirements. In contrast, SCF-UK determines that the harvest was 110% of normal compared to the 1990s average, and multiplies this percentage by the baseline percentage of food needs met by food crops for rich, modal and poor families in the area (55-60%). It determines that 60-65% of caloric needs were met by food crops for typical households in 1996/97, significantly different from the 16% of the annual food requirement that was derived by the FEWS methodology.

The reliability of each method is dependent on the level of accuracy of government statistics. It is also possible that government data is more reliable in some areas of the country than others. An examination of actual government statistics for Manjolo communal area show that the average number of calories for all sources of food and income (including relief) in the 1990s is 114 kgs or 46% of annual needs (using FEWS annual requirement of 250 kg per capita). By comparison, the average for the 1980s is approximately 139 kgs or 56% of annual needs. It seems unlikely that anyone would still be alive in Manjolo if these figures were true. The percentage of annual food needs met will change if different annual maize requirements are employed as the benchmark. However, the shortfall in the long term average (no matter which annual maize requirement is used) suggests that some sources of food and income are being underreported or not captured at all.

In comparing government data to household surveys, FEWS notes that "[t]he impersonal nature of the data sets available at these [governmental] levels are a strength in allowing food security conditions to be assessed objectively…, compared to household surveys." (FEWS and FSTAU 1997) The baseline data in the SCF-UK approach could be less valid because they are derived from qualitative interviews (e.g., Eilerts 1997) rather than a large, random sample of households. SCF-UK's reliance on key informant interviews is partly based on a desire to test a cost-effective means of collecting baseline data. Without an exhaustive number of household surveys, it is difficult to assess baseline profiles' accuracy. One accuracy test performed on the Zimbabwe baseline database was a hindcasting exercise involving 1992 harvest estimates and cattle off-take information (c.f., Boudreau 1997). Predictions from this exercise compared favorably to

1900 kcals is the minimum average individual (average of all age groups, males and females, in a typical developing country) daily requirement (FAO 1993).

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historical accounts of food shortages in the 1992 drought.

The validity of the SCF-UK database is also related to how often it is updated. The baseline is supposed to represent the typical year scenario, but the normal situation may evolve at different rates in different regions of Zimbabwe.

The Conceptual Validity of Each Model

There are key differences in the way that the SCF-UK and FEWS methodologies integrate information and conceptualize food systems, which may be evaluated in terms of Zimbabwean realities.

While the FEWS' maize equivalency approach uses communal areas as its basic unit of analysis, SCF-UK uses food economy zones. FEWS's approach provides information according to a unit at which government relief efforts are undertaken. However, such units of analysis may be very heterogeneous in nature. A single communal area may include different agroecological zones, ethnic groups, and varying levels of market infrastructure (which may impact food production and access). Communal areas also encompass only small-hold farmers, as both the urban and permanent farm worker populations often live outside of these areas.

SCF-UK food economy zones (if correctly defined) can contain a homogeneous population. In Manjolo, this means that four sub-areas are being assessed rather than one (probably accounting for some of the difference in deficit predictions). However, in Zimbabwe, none of the food economy zones perfectly match up with one communal area. This discrepancy should not necessarily preclude analyses using one type of unit while reporting the results in administrative units, but food economy units should be converted back to administrative units for reporting.

The selection and relative weight accorded to data parameters differs between the FEWS and SCF-UK models. In some instances, FEWS data quality concerns may override consideration of parameters deemed important by a conceptual model of Zimbabwean food systems. In contrast, SCF-UK determines the parameters it monitors based on field surveys, not government data availability. In many instances, information is required by the SCF-UK model that is not available on an annual basis from government sources, e.g., levels of wild food collection. In these cases, the analyst must either conduct a survey or make an informed judgement call.

FEWS and SCF-UK differ in the relative weight they assign different parameters in their conceptual models of household food security. FEWS straight-forwardly adds sources of food and income whereas SCF-UK weights these data based on the relative importance of a source of food or income in its baseline - an important difference when one considers the nature and availability of different types of data in Zimbabwe. Different weighting of government data impacts the deficit predictions produced by each methodology.

As previously discussed, the household food economy approach disaggregates its analysis in terms of income groups (poor, mode and rich), whereas FEWS does not as the secondary data sources do not permit it. However, agricultural production and income generating levels differ greatly between rich and poor in nearly all areas of Zimbabwe. It is not unusual for the top 20% of producers to generate 60-85% of market surpluses (Jackson 1999). In the absence of disaggregated analyses, these production disparities disguise deficits among the most vulnerable.

The final conceptual difference between the two methodologies is the treatment of food produced and food acquired through purchase. FEWS uses the prevailing market price to convert all sources of income to maize equivalents on the assumption that food is always available at the local market if consumers can pay for it. FEWS also assumes that the food value of these income sources will remain fairly constant during periods of food shortage. SCF-UK distinguishes between food that is acquired directly through own production and food that is acquired indirectly through purchase. For food that is acquired through purchase, quantities obtained are allowed to vary if: 1) income varies due to market effects or 2) food prices change due to varying demand. There are at least two problems with the SCF-UK food market model in the Zimbabwean context. First, prices vary according to elasticities and there is a general data problem in obtaining these figures for different types of markets (e.g., food, livestock, labour). Second, RiskMap does not allow increased food demand in a neighboring area to affect local food prices (although other types of markets are shared).

Conc lusi on

In relation to the broad objective of this paper, we first sought to determine the strengths and weaknesses of SCF-UK's household food economy and FEWS' maize equivalency approaches in comparison to other early warning methodologies. Both methodologies attempt to quantify shortfalls and access at the sub-national level. The two also seek to combine different sources of food and income into annual food needs. The FEWS approach examines the situation of the average individual within a particular administrative unit. The SCF-UK household food economy approach seeks to understand the situation of wealthy, modal, and poor households in a socio-ecologically determined food economy zone.

When the FEWS maize equivalency and SCF-UK household food economy approaches were employed in Manjolo Communal area of Zimbabwe, they produced food deficit estimates that differed significantly. Rather than declaring one food security monitoring system superior to the other, we feel it is better to focus on elements of these systems that seem most promising. An important advance of food economy zones is that they identify homogeneous livelihood units. Nonetheless, this advance is impractical if it can not be related to the administrative units for policy implementation. Analyzing one unit and reporting results in terms of another is not an insurmountable obstacle. Distinguishing between the needs of the rich and poor in any given area is also important, particularly in situations where the disparities are considerable. Combining an understanding of how food systems function at the local level with regularly collected government data warrants further experimentation. Given limited resources, however, food security monitoring systems may always provide an imprecise estimate of food shortfalls.

4. 1900 kcals is the minimum average individual (average of all age groups, males and females, in a typical developing country) daily requirement (FAO 1993).

5. It is noted that FEWS also took the average figures for the 90s and used them to represent the case in 1996/97 for employment, remittances and other non-farm income. Given that SCF-UK had not conducted surveys to determine the current year levels for these categories, the most conservative assumption in this comparative analysis seemed to be to suppose a normal or average situation (thus leaving any difference in outcome of the two analyses dependent on methodology).

6. When the scenario was run with coping strategies, the food deficit was zero in all cases.