Food Policy 49 (2014) 84–94

Contents lists available at ScienceDirect

Food Policy

journal homepage: www.elsevier.com/locate/foodpol

Monitoring global and national food price crises

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ARTICLE INFO

Article history:
Received 7 August 2013
Received in revised form 18 March 2014
Accepted 5 June 2014

Keywords:
Food insecurity
Food prices
Monitoring
Crisis
Calibration
Global
National

ABSTRACT

This paper develops, calibrates, and runs a new food price crisis monitoring framework. The proposed framework has an integrated approach to capture global and national vulnerabilities and offers an alternative to existing food insecurity information systems, which suffer from a lack of consensus on the definition of "food crisis." The framework successfully identifies the recent episodes of food price crises in 2008, 2011, and 2012. This paper also recommends ways in which the framework could be refined to increase country coverage and provide better information on country-level food inflation.

Introduction

On September 24, 2011, the international community met in New York to pledge US$218 million of new humanitarian aid to the Horn of Africa famine. This pledge came almost exactly a year after the Food Security and Nutrition Analysis Unit (FSNAU) of the Food and Agriculture Organization (FAO) reported that 2 million people are in need of emergency humanitarian assistance in the region. Twelve months later, and with an additional 10 million people in dire distress, the international community sprang into (concrete) action.

The hiatus between warning and action is all the more striking because a number of agencies, such as the FAO, the United States Agency for Information and Development (USAID) and the World Food Programme (WFP), among others, have been developing food security information systems for a long time, some dating back as far as the early 1970s. Humanitarian food crises and long-term food insecurity are old, recurrent and persistent phenomena, but late responses like the one seen in the Horn of Africa are not isolated events. In fact, for all food security crises that have taken place since 2005—in the Horn of Africa, West Africa, Niger, and Guatemala—there was an alert issued at least six months in advance. Buchanan-Smith and Davies (in Darcy and Hoffman [2003, 31]) have gone further, and blame the slow and inadequate responses to "failures by donors, in particular, to respond to the available evidence."

The literature on the timing of food insecurity responses points to a number of causes, from "poor understanding of the principles, inappropriately designed monitoring systems, operational inefficiencies in implementation" early on (Babu and Mthindi in Babu and Pinstrup-Andersen [1994, 218]) to the inability to differentiate between chronic and transitory food insecurity (Devereux, 2006); delayed dissemination of food security information, planning, and budgeting cycles of donors; disconnections among agencies' coordination; and "inappropriate communication [...] and ambiguous 'marketing' language not supported by the assessment" (Poulsen et al., 2009, 35). This paper contributes to the literature in two ways. First, it complements the few previous assessments of food insecurity responses by focusing on one of the contributors of late international responses to food insecurity that has received relatively less attention: the ability of the international community to identify and anticipate an unfolding food crisis or, more specifically, a crisis generated by rising international food prices such as those observed in the last five years. This is not to argue that prices are the only factor driving food security crises. They are not. The multiple causes and manifestations of food insecurity crises include agriculture production, nutritional aspects, presence and functioning of markets, climate conditions, conflict, livelihoods

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http://dx.doi.org/10.1016/j.foodpol.2014.06.001
0306-9192/

assets and strategies, natural resources availability, and the presence of social safety nets and risk management schemes, among other drivers, not to mention the political, socioeconomic, civil, institutional, historical, and cultural macrolevel contexts and microlevel conditions relevant to individuals and families, such as, for example, gender interactions, intrahousehold allocations, or care practices (IPC, 2012). Yet, food prices arguably constitute a critical factor affecting food security in a global context, beyond the specific reasons and contexts within countries. In fact, Benson et al. (2008) emphasize the convening role of food prices to reflect demand and supply drivers, on the one hand, and the effects from policies and from what they call "conditioning factors" (such as, for example, trade market structures, infrastructure, households characteristics, or intrahousehold allocation) on the other. Second, this paper proposes a new framework that combines a domestic, country-specific context with price movements at the global level. The framework seeks to identify and, most importantly, assist governments and international development agencies in preparing responses to the eventual crisis typically caused by shocks that may not necessarily be circumscribed within a given country. The final objective of this tool is to complement—rather than substitute for—existing monitoring frameworks that typically deal with either global or national levels, but not both simultaneously.

This paper starts by zeroing in on the definition—or the lack of a consensus on the definition—of a food crisis and the operational properties on timeliness, coverage, and scope of the most prominent food insecurity monitoring systems currently in place (Section 'Crisis or crisis not? identifying a food insecurity crisis'). Given the conceptual and operational limitations identified, Section 'An alternative analytical framework' develops a new information framework that uses a narrower definition of food crisis based on food prices and that is empirical in nature; that is, it defines a food price–related crisis using past trends. Despite the definition of crisis being narrower, and admittedly omitting other drivers of food insecurity, the framework truly integrates global and domestic stages of food insecurity around a concept of vulnerability. Section 'The framework at work' calibrates the framework across alternative thresholds and indicators, for both global and domestic stages, finding those that perform best in terms of identifying the peak of the crises while minimizing false positives. Section 'Applying the monitoring framework: 2011 and 2012' applies the framework to years 2011 and 2012, finding that the selected indicators and thresholds identify the observed global price spikes as well as the regional Horn of Africa crisis. Importantly, results also indicate that there are subregion-specific crises that would not have been picked up by monitoring global prices alone. This underscores the importance of fully integrating global and national stages into the framework. Section 'Conclusions' presents concluding remarks, limitations of the framework, and proposes a simple institutional architecture for implementation.

Crisis or crisis not? Identifying a food insecurity crisis

Although the concept of food security now has a widely accepted definition—namely that "food security exists when all people, at all times, have physical and economic access to sufficient, safe and nutritious food for a healthy and active life" (FAO, 1996)—the concept of food crisis has not. Defining a level of crisis for both analytical and operational purposes has proven an elusive task. In fact, the use of *food crisis* ignores whether the situation has a global scope (such as increasing internationally traded food commodities due to a shock like the recent droughts in the United States) or a regional or country-specific nature (such as the 2011 Horn of Africa famine). As a result, the terms *famine*, *food insecurity crisis*, *humanitarian disaster*, and *food crisis* are often used almost interchangeably. Because crises have different natures and degrees of severity, and therefore require different interventions, a poor definition of crisis goes beyond being merely a semantic issue.

Both the FAO and the WFP differentiate transitory from chronic food insecurity and talk specifically of "crisis-induced food insecurity" (FAO and WFP, 2009, 17). This includes both sudden shocks (for example, due to a flood or conflict) and crises that develop progressively (for example, due to drought or economic collapse; FAO and WFP, 2009, 14). However, WFP's 2008–13 Strategic Plan contains not even a single mention of the term *food crisis*. Instead, the plan speaks of an *emergency*, defined "as urgent situations in which there is clear evidence that an event or series of events has occurred which causes human suffering or imminently threatens human lives or livelihoods and which the government concerned has not the means to remedy; and it is a demonstrably abnormal event or series of events which produces dislocation in the life of a community on an exceptional scale" (WFP, 2008, 13). In monitoring such emergencies, the WFP uses indicators of mortality rates, nutrition and food security, but warns that contextual and qualitative information should always be used to support the analysis (WFP, 2009). FAO-GIEWS (Global Information and Early Warning System on Food and Agriculture) does not have a formal definition for food crisis either, but establishes three conditions that categorize a region as in a food crisis: (i) lack of food availability; (ii) limited access to food; and (iii) severe but localized problems (FAO, Undated).

The Integrated Food Security Phase Classification (IPC) was originally developed in Somalia under the FAO Food Security and Nutrition Analysis Unit (FSNAU) by a multiagency partnership of eight major United Nations' (UN) agencies and international nongovernmental organizations (NGOs), including WFP and FEWS NET (Famine Early Warning Systems Network). IPC classifies different phases of food insecurity, including crisis, for areas and household groups. An area is in crisis (or phase 3) when "at least one in five households in the area have the following or worse: food consumption gaps with high or above usual acute malnutrition; or are marginally able to meet minimum food needs only with accelerated depletion of livelihood assets that will lead to food consumption gaps" (IPC, 2012). Further deterioration of the situation will cause the area to slide into phase 4 (that is, emergency) or 5 (famine). To determine the food insecurity level of a given country, the IPC uses indicators such as crude mortality rate, acute malnutrition, stunting, food access/availability, dietary diversity, water access/availability, hazards, civil security, livelihood assets, and structural factors.

The World Bank does not have a specific information system to monitor crises, which may be related to the fact that it does not see its role as one of providing immediate emergency responses. Its Global Food Crisis Response Program—under whose guidelines US$1.2 billion were mobilized between 2008 and 2012—also does not contain an explicit definition of food crisis. In fact, the Bank's Operational Manual 8.00 (World Bank, 2007) does not differentiate between *crises* and *emergencies*, and also uses the term *disaster* in stating when the Bank can respond to a borrower's request for assistance, which is in "an event that has caused, or is likely to imminently cause, a major adverse economic and/or social impact associated with natural or man-made crises or disasters" (World Bank, 2008). The European Commission specifically defines a food crisis as "a humanitarian crisis arising from inadequate food consumption, poor food utilization or high prevalence of acute malnutrition" (European Commission, 2010, 28). A crisis is understood in terms of deviations from the norm—with all the challenges that the need to define the norm and to set the threshold for response entail. Finally, the UN International Strategy for Disaster Reduction (UNISDR) discusses disasters that affect food security; however, its Strategic Framework 2025 does not mention food crisis (UNISDR, 2011).

This cursory review of the concept of food crisis shows key agencies failing to adopt a common definition for such a crisis. Agencies either adopt a relatively vague definition that includes both causes (such as floods or economic collapse) and symptoms (threat to human lives or disruption of livelihoods) or use past and current evidence to inform a judgment. What most approaches emphasize is the abnormal nature of a crisis, even when notions of normality and severity may not be clearly defined. In practice, this lack of a common and specific definition provides limited ground for analysis, preventive action, and timely collective action by the international community (Hillbruner and Moloney, 2012). Furthermore, different analyses of the severity and nature of the crisis may spur not only different response timing, but also different types of responses based on whether the crisis is considered chronic, transitory, or cyclical and severe or moderately serious (Devereux, 2006). But even if there were a precise understanding of what a crisis is, it would remain to be seen whether existing information systems would be capable of anticipating unfolding food crises from analytical and operational standpoints. The literature has not settled that question so far. In fact, it has provided very few insights (Darcy and Hofmann, 2003, 45). There are, however, two critical properties that are unlikely to be fulfilled among current systems. One is timeliness. The *Joint Thematic Evaluation* (Poulsen et al., 2009) found that while WFP and FAO products are "done in a timely manner" (ibid, 43), they often fail to inform decision making in the same fashion.[3] The second property is coverage. The *coverage* of units and topics of analysis vary the most among surveyed systems. GIEWS monitors predominantly national-level food security and makes efforts to monitor food security at subnational levels too. It collects information on indicators such as local market food supplies, retail price rises, and evidence of individual and community responses to food insecurity (coping mechanisms; FAO-GIEWS, Undated, 16).[4] IPC draws on livelihood analyses at the community level. It is fully developed and ongoing in 20 countries across Africa, Asia, and Latin America—another 16 countries have some level of engagement with the IPC, but are not fully developed (IPC, 2014). Along with the IPC, WFP's food security and vulnerability analyses are the most comprehensive in terms of the primary questions analyzed.[5] Currently, there are about 70 countries that have had a food security and vulnerability assessment conducted (WFP, 2013).

Our assessment shows that existing information systems individually generate a vast amount of data, information, and analysis related to food security at global, regional, national, and subnational levels. Food insecurity is, as a result, monitored on a continuous basis through a variety of information system functionalities and products such as baseline and/or rapid assessments, remote sensing, alerts, and cartographic protocols. But, while all the systems reviewed here clearly have value in the early detection of severe food security situations, none of these systems can, at the same time and in integrated fashion, monitor global *and* national-level key indicators and raise a flag without an extensive and laborious assessment. Those aspects of the existing frameworks jeopardize, to some extent, the effectiveness of required rapid responses to unfolding food security crises—including those such as price food crises, which may unfold quickly with severe consequences across the globe.

In the absence of a genuine common ground in the understanding of food crises, and in the presence of practical constraints for operational purposes, this analysis proposes and articulates a pragmatic, evidence-based, and narrower focus on food price crises. To be clear: food prices are not the only or main cause or type of food crises, but they are the most recent crises to be truly global, while also having important regional and country implications.

An alternative analytical framework

Conceptualization

The goal of the proposed monitoring system is to provide early detection of unfolding food security crises related to prices in the most vulnerable—International Development Association (IDA)—countries. Vulnerability is determined by a country's degree of exposure to domestic food price spikes and limited macroeconomic capacity to mitigate their effects. Contrary to previous systems, the proposed framework consists of two fully integrated components, the global and domestic stages. The framework identifies, compares, and calibrates several indicators and triggers in the global and domestic stages. The calibration exercise determines the best-performing triggers in terms of identifying past crises' peaks; minimizing false positives; early detection of the crisis (that is, the number of months before the price peak is reached); and length of the crisis.

Conceptually, the framework is designed at two levels. The first is the *global* level, which captures global or regional shocks affecting or expected to affect food security. The second is the *domestic* level (country specific), which focuses on the exposure of each IDA country to the shock, and the country's capacity to manage and withstand the shock's impacts. The presence of two stages does not imply necessarily that both are always closely and inevitably linked. The pass-through of international prices to domestic prices is not automatic, either because national markets are not internationally integrated, or because even when they are, price transmission lags several months on average (Meyer and von Cramon-Taubadel, 2004; Baffes, 2010). Rather, the two stages of the framework ensure that specific countries' vulnerabilities to global shocks are carefully analyzed, and also that domestically generated alerts are not overlooked when global prices are calm.

Operationally, the monitoring framework will generate two types of alerts: top down and bottom up. In the top-down approach, the alert system is activated during the global stage after either or both global food and fuel prices exceed some predefined threshold. Then, domestic indicators are analyzed to determine the severity of each IDA country's vulnerability to the global alarm. The bottom-up approach focuses on domestic vulnerability and sounds the alarm—even in the absence of global crisis—when two or more countries in a region or subregion exceed their domestic price and macroeconomic triggers. Specifically, the following situations will activate the alert system:

(i) Whenever one or both indicators in the global stage exceed the indicated trigger, the alert system will be activated throughout the month the trigger is exceeded.
(ii) Even when the global stage indicators do not trigger the alert system, if either domestic food prices alone or domestic food prices and macroeconomic vulnerability worsen beyond their threshold levels for two or more countries in a given subregion/region, then the alert system will be activated.

[3] Assessments take place according to agricultural calendars, or shortly after emergencies, which do not always coincide with the decision-making calendars of donors and governments (for example, annual planning and budgeting of fiscal year). Moreover, whereas assessments can occur at the right time, the final reports are usually susceptible to long editing and approval processes (by issuing agencies and affected country).

[4] When available, data on malnutrition and food-related morbidity and mortality are also monitored. Alerts are based on readings of the food supply and agricultural situation in the countries or subregions. Rapid evaluation missions can follow if conditions are deemed severe (FAO-GIEWS, undated).

[5] Key questions include who is food insecure or vulnerable; how many are there; where do they live; why are they food insecure or vulnerable; how is the situation likely to evolve; what are the risks threatening them; what should be done to save their lives and livelihoods (WFP, 2010); how severe is the situation; where are different geographic areas with food insecure populations;; and when will people be food insecure (IPC, 2012, 27).

The requirement of two or more countries ensures that it is truly a regional crisis, that is, not just an idiosyncratic crisis circumscribed to a single country that might be picked up by any of the already existing country-specific systems. But if such an idiosyncratic shock propagates to other countries, the proposed framework will capture it. In other words, this analytical feature of the system does not imply implicitly or explicitly that food crises generated and transmitted within the boundaries of a specific country are not important or worth monitoring. They are. Rather, it argues that information tools able to capture such domestic crises already exist. The gap is in the early identification of crises that are either globally generated and transmitted to individual countries, or those that originated in an individual country to then spread to others inside and/or outside their region.

In principle, the framework should monitor all shocks that may affect food security. In practice, the framework focuses on direct global shocks, namely, those related to global food prices. These shocks are expected to affect a country's food security situation in two ways: directly, by contributing to increases in domestic food prices, the overall cost of living and fertilizer and transport costs, or indirectly, by contributing to policy responses such as export bans that affect access or prices of food. Global macroeconomic shocks (fiscal, financial, and trade) may also affect food security. To the extent that global macro shocks affect global prices of food and/or fuel, they will be captured in those components of the monitoring system. To the extent that they are specific to the countries they affect, they are covered in the second/domestic stage of the framework.

Simplified by domestic food inflation, the second or domestic stage will capture the specific exposure of each IDA country to food insecurity. Country capacity to confront such crises is also monitored. The underlying notion is that—more likely than not—the more vulnerable the country is to macroeconomic shocks, the more vulnerable the country is to a severe food insecurity situation. Other domestic factors that may affect the vulnerability of a country, such as its safety nets (or social protection in general) or physical and legal restrictions to access and distribute food internally within the country (mostly related to trade, infrastructure, risk management, and legal systems within the country), are not included in the framework, but may also need to be considered. These factors are omitted because of the lack of technically satisfactory indicators at a sufficiently large scale.[6]

Indicators, triggers, thresholds, and data sources

The proposed system will be useful to the extent that is able to sound the alarm at the onset of crisis situations to provide governments with time to act. To do this, the system potentially needs three elements: (i) triggers calibrated initially to predict past crises and assessed periodically to ensure a good ability to predict future crises; (ii) *mechanics* to activate triggers that are flexible enough to capture regional and subregional situations, even when global indicators do not trigger an alert; and (iii) frequently updated and available variables.

[6] For example, the World Bank's Country Policy and Institutional Assessment (CPIA) provides scores for about 150 low- and middle-income countries in terms of the quality of their policies and the capacity of their institutional frameworks to foster poverty reduction, economic growth, and make effective use of development assistance. Two of the dimensions covered by the CPIA are trade and social protection policies. On the trade dimension, countries are given a ranking 1–6 based on criteria associated with trade regime and trade facilitation, while for social protection, countries are assessed based on the extent to which their social protection systems mitigate social risks, protect against destitution, promote human capital development and income generation, and function through periods of crises (World Bank, 2013). Although the rankings are provided annually for a large number of countries and the tool is regarded as reliable and relevant, CPIA critics cite it for poor sensitivity that hinders its ability to capture changes within countries.

The monitoring framework therefore comprises the set of indicators, triggers, data sources, and rules for when to sound a crisis alarm. Table 1 provides a set of proposed indicators, their sources, and descriptions of criteria that would trigger an alarm. For each indictor considered, different triggers are considered and analyzed in the calibration exercise. As such, indicators and triggers in Table 1 are at this point possible candidates to monitor food price–related crises—in terms of a number of desired properties explained below. The calibration exercise will determine which indicators and triggers perform the best. Indicators in Table 1 include the Global Food Price Index (FOPI) reported by the World Bank's Commodity Price Data historical series (the Pink Sheet). It weighs the international prices of three sets of commodities: cereals (which include maize, rice, wheat, and barley) at 28%; fats and oils (coconut oil, groundnut oil, palm oil, soybeans, soybean meal, and soybean oil) at 41%; and other foods (bananas, fishmeal, beef, chicken, oranges, and sugar) at 31%. The Global Cereal Prices Index (GCPI) is the subset of cereals within the FOPI, with relative weights of 41% for maize, 25% for wheat, 30% for rice, and 4% for barley. The domestic food price series come from the FAO's GIEWS Food Price Data and Analysis Tool. It refers to specific commodities prices (as opposed to overall food inflation), adequately cataloged in terms of variety and quality. Price reporting specifies whether the series refers to specific local markets or national level averages, or whether prices are retail or wholesale. Price information typically comes from official domestic sources, such as ministries of agriculture and national institutes of statistics. The IPC, as already noted, is a classification system that categorizes geographical areas within a country from 1 to 5 levels, from generally food secure to famine/humanitarian catastrophe. Each phase is defined by converging direct and indirect evidence (rather than absolute thresholds) across key reference outcomes in the dimensions of mortality, (acute) malnutrition, stunting, food access and availability, water access and availability, hazards, civil security, and livelihood assets (IPC, 2012). Finally, macroeconomic variables refer to the standard definitions reported by IMF's *World Economic Outlook* on the levels of the general government gross debt; the general government net lending/borrowing to capture its fiscal balance (that is, the difference between revenues and grants and expenditure); current account balances; foreign exchange, imports, and gross domestic product.

Section 'The framework at work' presents the final selection of the indicators and triggers in the monitoring system that are ultimately determined through a calibration exercise. The calibration exercise considers several triggers for the indicators reported in Table 2 and compares them to some desirable features. Trigger *properties* comprise: the individual trigger's capacity to identify the global food price hikes of June 2008 and February 2011; the length of the alert (that is, how long the alert remains activated); the length of the early warning provided before the price peak by the trigger's activation of the alert system; and the incidence of false positives, that is, periods not considered to be in crisis, but for which the triggers activated the alert system. For the calibration exercise, specific starting dates are assumed for the 2008 and 2011 price hikes based on the onset of the trend leading to the price hike (Fig. 1). This helps identify false positives and ultimately produces a framework that identifies food crisis situations in the most parsimonious manner. Although there is not a scientific way to determine when the crises specifically started, for this exercise, *false positive* refers specifically to alerts outside a period of crises defined for this purpose as the period between July 2007 and June 2008 and the second half of 2010 until February 2011 (June 2010–February 2011, Fig. 1). These dates are intended to capture a general consensus emerging on the start and duration of food price spikes, and although these dates may not be universally accepted, they are largely acknowledged as accurate. This selection

Table 1
Monitoring system: a wide range of potential candidates. *Source*: Authors' compilation.

Variables	Indicators	Triggers	Frequency and source
Global stage: multicountry shocks			
1.1. Global Food Price Index (FOPI)	1. Level of FOPI 2. Number of consecutive months of sustained FOPI increases 3. Change in FOPI 4. Unusual deviation from historical trend	1. FOPI exceeds a specific fraction of the June 2008 food crisis peak: fractions considered are 75% and 50% of the 2008 peak 2. At least five consecutive months of FOPI increases 3. FOPI increase exceeds 15% in a five-month period 4. FOPI is beyond 3 SD from historical trend (1960–2000)	World Bank DECPG Daily/monthly information
Domestic stage: country-specific vulnerability			
Exposure 2.1 Domestic food price increases	1. Cumulative domestic inflation of any key staple 2. Number of consecutive months of sustained price increases of a key food staple 3. Unusual deviation from IDA sample	1. Increased price of food staple exceeds 15% in a period of five months 2. At least five months of consecutive price increases 3. Key food staple price increases exceed 3 SD around the mean of food price inflation for the IDA sample	FAO monthly data series and/or national statistical office information; either option would provide an incomplete picture for the entire IDA sample Typically updated with lag of months, depending on country
2.2. Risk of food insecurity emergency	1. IPC	1. IPC of 3 to 5	FAO-FSAU provides reports on outlook for next three to six months and updated alerts as situations change
Capacity to react 2.3. Macro space	1. Fiscal balance as % of GDP 2. Public debt as % of GDP 3. FX reserves to imports (in months) 4. CA as % of GDP	1. Fiscal deficit > 3% of GDP 2. Public debt > 60% of GDP 3. FX/M < 3 months 4. CA > 3% of GDP	Annual data updated from IMF's *World Economic Outlook*

Note: CA = current account; FX = foreign exchange; GDP = gross domestic product; IPC = Integrated Food Security Phase Classification; SD = standard deviation(s); M = imports.

Table 2
Incidence of global food price alerts. *Source*: Authors' compilation.

	% Of 2008 FOPI peak 50%	5 Consecutive months FOPI	15% Price increase in 5 consecutive months FOPI	15% Price increase over 5 months FOPI	3 SD (1960–2000) FOPI	Detrended 3 SD (1960–2006) FOPI
Incidence, # of	73	25	13	16	67	13
Incidence, %	48	16	9	11	45	9
June 2008 peak	Yes	Yes	No	No	Yes	Yes
February 2011 peak	Yes	Yes	Yes	Yes	Yes	Yes
When 2008	October-06	August-07	November-07	November-07	December-06	March-08
Length of alert, # of months	69	11	7	7	67	5
When 2011	October-06	November-10	November-10	September-10	August-10	January-11
Length of alert, # of months	63	4	4	6	67	8
False positives	2	4	1	1	2	0
False positives, # of months	4	10	2	3	3	0

is informed by the own food price trends but, in the absence of ex ante criteria to define what a crisis is, the very problem this exercise tries to address, this selection is arbitrary. Yet, the selection of peaks and duration was consistent, that is, it used the same process of identifying peaks and accelerated increases and slowdowns in price declines, which should prevent duration biases from emerging (and, ultimately, a self-serving exercise).

It is worth noting that even if informed, the initial choice of triggers is based on the past, because we cannot calibrate the future. The calibration, however, aims at understanding how setting the bar too high or too low for an indicator affects the monitoring framework. The objective is to find a level that is neither so low that every seasonal spike is registered as a potential crisis, nor so high that a potential crisis goes undetected until it is a full-fledged crisis. This is an empirical exercise, because there is no theory that determines which level with respect to a peak should be considered as a crisis level, which is consistent with the lack of a consensus on what officially constitutes a food crisis.

The first trigger corresponds to the FOPI and it sounds an alert when a certain threshold value of the June 2008 peak is surpassed. The analysis considered the thresholds of 75% and 50% of the value of the FOPI at its June 2008 peak. For other indicators, the analysis focused on instances in which there were five consecutive months of price increases. Again, this is an arbitrary notion of protracted price increases. But the choice of five months is long enough to transcend a typical crop cycle, which enables the analysis to distinguish price movements that may be purely seasonal from those that may be more persistent. The choice is also consistent with the empirical fact that the series of global food price crises does not record any price increase streak longer than five months in the period 2000–2012. The calibration exercise also checks three months of sustained increases in food prices.

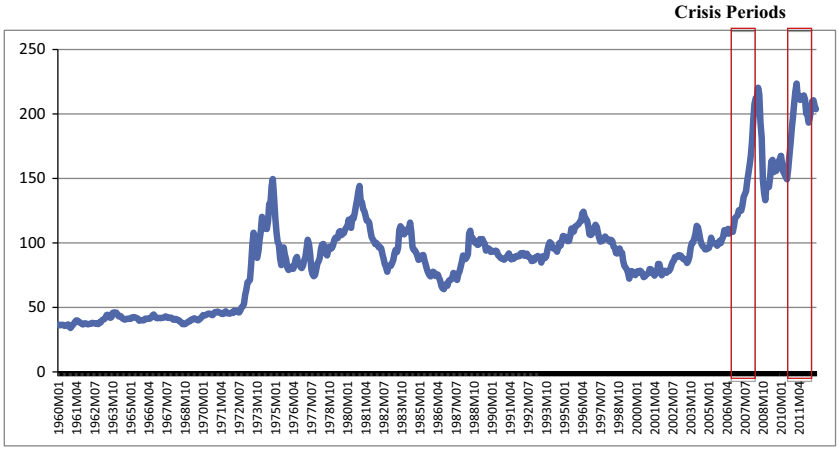

Fig. 1. Monthly global food price index, 1960–2012. *Note*: The crisis periods correspond to July 2007–June 2008 and June 2010–February 2011. *Source*: World Bank (2012a).

With regards to price levels defining a crisis, there is no conclusive analytical work that connects price increases to food security deterioration, as there is, for instance, evidence leading to well-established unsustainable debt levels or inflation beyond which economic growth takes a toll or, a given level of economic growth and a sustained pace of poverty reduction, to cite some examples. In the case of food crises, there is a compounding problem of an indicator being widely used to capture food insecurity. As a result, the comparison of food prices with food insecurity becomes more troublesome. What existing evidence shows is that, first, distinctive measures of food insecurity correlate relatively well among one another—between 0.33 and 0.58—and, second, (subjective) food insecurity indicators "strongly correlate with other welfare indicators and relative food prices."[7] The selection of the threshold then becomes an empirical question; to answer it, the analysis focuses on price increases of 15% or more. The justification for this figure is that the average annual increase for years in which the global food price index increased since 1960 is 12%; the average price changes for years without price spikes is 8%. The average increase among the five years in the series with serious price spikes is 42%. Arguably, a 15% increase in five months implies a 3% monthly increase in prices, which is close to the increase for those years with price spikes. The monthly price increase that is considered unusually high is adjusted to a five-month period consistent with the consecutive period criterion discussed above. Then, the 15% food price increase is analyzed for five consecutive months, and for five months relaxing the condition of consecutive price increases observed in all five months. As discussed in Section 'Domestic stage', it is not possible to do a similar calibration for domestic prices as conducted for international prices, mainly because of the lack of a sufficiently large and comprehensive series of food prices at the domestic level. Yet, as is the case for global prices and food security crises, it is believed that domestic prices are also a highly relevant driver of food insecurity because they convey information from demand and supply factors and are affected by other drivers, such as policy decisions or institutional and political conditions (for example, ranging from trade restrictive policies to civil conflict). Finally, unusual prices are defined statistically as those that exceed 3 standard deviations (SD) of the series from 1960–2006. It is important to caveat this with the fact that the SD of a nominal series over a four decade period is highly simplistic, not least because each of the series considered may have undergone structural breaks. However, this crude tool is an initial starting point. This assessment takes it an additional step further and replicates the exercise after detrending the series in an attempt to get rid of potential seasonality effects, that is, of predictable, recurrent, and transitory effects. In addition, the benchmark period is determined by the fact that the available food price series goes all the way back to 1960. Furthermore, the year 2007 marks the onset of a sustained price increase trend after two disparate periods, 1960–72 and 1973–99, of stable and volatile global prices, respectively (Fig. 1).

Ideally, it is domestic food price inflation that should be monitored at the country level. Unfortunately, there are not sufficiently large sets of domestic prices for the purposes of this exercise. This is clearly a limitation, as already noted. The FAO GIEWS database has 1175 monthly domestic retail and wholesale price series of major staples consumed in 84 countries, and 36 international cereal export price series covering a total of 20 different food commodities as of July 2012. However, the data used in this analysis are a subset of this whole. Selected countries have data at least as far back as January 2005, with the most important staple for each of the countries in terms of consumption identified. The price series followed is either the national average price or the price that prevailed in the capital city. The resulting sample consists of 63 countries; 7 from East Asia and Pacific (EAP); 9 from Europe and Central Asia (ECA); 14 from Latin America and the Caribbean (LAC); 1 from Middle East and North Africa; 7 from South Asia; 9 from eastern Africa; 12 from western Africa; and 4 from southern Africa.

Circumscribing the analysis to individual staple food prices (rather than domestic food inflation) is not ideal. It is well known that the consumption of staples is subject to substitution, typically for cheaper staples or for nonstaples, as prices go up (World Bank, 2012b). But monitoring a specific number of staple prices per country, or a predetermined mix of particular staples (say wheat, rice, and maize), would further restrict the sample size. As a result, the key domestic staple for each country for which prices are reported is considered in the domestic stage of the analysis. Even though this decision responds to practical reasons, the resulting limitation is that the monitoring framework provides a picture that focuses on single staples and not on the whole food consumption

[7] Headey (2013) reports these correlations among the subjective Gallup (2011) World Poll's food insecurity and hunger variables and FAO's hunger variable, and underweight and stunting among children from FAO, Demographic Health Surveys, and the World Health Organization data sources. However, when directly correlating food inflation with the Gallup World Poll's food insecurity, a lower level of 0.15 is reported. The conclusion is that correlations may not be as strong as suggested by other simulation-based analyses that estimate large poverty increases from food price hikes—as well as large distributional implications, that is, winners and losers—as in Cuesta et al. (2010); Ivanic and Martin (2008); Ivanic et al. (2012); Zezza et al. (2008); Valero Gil and Valero (2008); Aksoy and Isik-Dikmelik (2008). See Headey (2013) for plausible explanations of those mixed results.

basket of a given country. To the extent that food consumption patterns are dominated by more than a few staples, the proposed analysis will overlook potential threats from a food security point of view.

The framework at work

For each of the triggers, a benchmarking exercise is conducted to examine how soon these triggers would have activated an alert during the most recent food price crises (July 2007–June 2008 and June 2010–February 2011). Also, the analysis benchmarks the number of consecutive months that the framework alert would have persisted. In addition to defining the triggers based on the FOPI, triggers were also defined based on the global cereal price index, the fuel price index, and the fertilizer price index (not shown here). The cereal price index is a component of the food price index, while fertilizers and energy are essential complements in the production of food and are likely to carry useful early signals about any impending price shock. The results of the calibration exercise are presented for the global and domestic stages.

Global stage

Appendix A (online) reports the results of the calibration exercise for the period 2000–2012 (up to July), month by month. Table 2 summarizes the key findings of the exercise and shows the number of months that each trigger would have activated an alert and whether the 2008 and 2011 global food price hikes would have been identified or missed—how early and for how long. Based on the performance of each trigger for these criteria, additional values for the triggers are considered as well.

The comparative exercise shows that the trigger of 3 SD around the mean of the detrended historical series from 1960 up to 2006 is the best performer. This trigger is capable of identifying the two periods of crises in 2008 and 2011 and the Horn of Africa disaster in the summer of 2011, and their peak months, respectively June 2008, February 2011, and July 2011—when Somalia officially reached famine status. It produces relatively short periods of alerts, but sufficiently early in terms of months of anticipation of the peak. For June 2000–June 2012, the period analyzed, the alert system would have been triggered about 20% of the time on account of global food prices. These results do not change much (not shown here) if the global grain price index and the fertilizer price index are substituted for global food and oil prices, respectively, although the fertilizer price index tends to increase the length of the activated alert.

The length of alerts shortens after introducing the criterion of consecutive months. In effect, five consecutive months of food price increases substantially reduces the incidence of alerts; shortens the average period of the alert; and identifies the crisis periods for 2008 and 2011. However, it still does not trigger an alert right at the peak of the 2008 crisis, because the June 2008 peak was preceded by a minimal decrease in the FOPI in May 2008. This decrease discontinues the streak of food price increases and therefore fails to activate an alert for the very peak of the crisis. Analysis also shows that the number and length of false positives increase. These findings do not change for a three consecutive month trigger. Because there were no streaks of price increases exceeding five consecutive months, triggers that include six or more consecutive months would have not activated any alerts between 2000 and 2012.

The trigger that combines five consecutive months and at least 15% price increases reduces slightly the incidence of alerts and the incidence of false positives for global food prices, but does not solve the problem of identifying the 2008 peak (for the reason explained above). Changes in the length of the consecutive months (three) do not solve the problem either (not shown in Table 2).

When considering at least 15% increases in food prices over a period of five months (even if price increases are not consecutive throughout that period), the system has a relatively low incidence of alerts, few false positives, short lengths of alerts and provides "reasonably" early detection, but still does not recognize the peak of 2008. The reason now is that the sharpest price increase during the 2008 crisis took place six months away from the peak, that is, from January to February 2008, which is a month shy of those included in the calculation of the five-month period up to June 2008.

The final trigger considered is an extreme deviation from a historical trend. The trend period considered in this analysis is 1960–2006. The trigger will set off an alert when the price index exceeds 3 SD from the historical mean. Three SD in statistical terms are considered an extreme deviation from a trend. Results show that this trigger solves the identification of the peaks, but at the cost of increasing—moderately—the incidence of alerts, especially for global crude and fertilizer prices. The length of the alerts also increases. However, as indicated above, detrending the historical series eliminates such caveats.

Domestic stage

Appendix B (online) reports calibration exercise results for the domestic stage. However, the following analysis focuses only on those cases where two or more countries of the same region or subregion—east, west, and south—in Africa set off the activation trigger for the domestic price of staples. Not included in this paper are results showing that relaxing the constraint of two or more countries in the same region will duplicate the number of country alerts (higher than 600 cases during 2000–2012).

Three factors to consider for the domestic price calibration exercise include:

(i) The historical series are much shorter for each country's prices and there are relatively few countries monitored any given year.
(ii) The analysis does not work with a domestic food inflation series, but with prices of specific food staples in each country. Therefore the 3 SD trigger results must be evaluated cautiously because the periods and countries available may not be representative of a long enough historical trend or a sufficiently meaningful IDA sample.
(iii) The analysis uses the IMF *World Economic Outlook* database, which contains annual data—not biannual or quarterly data—for the indicators included. The data on foreign reserves are available only up to 2011, and the source of that information is the World Bank's World Development Indicators Database.

These reasons underscore that it is not possible to come up with thresholds in the same way as calculated for international food prices in the global stage because insufficient information is available to allow a precise analysis and precise outcomes. Thus, for domestic prices, the analysis considered the trigger of 15% price increases in five months (regardless of whether or not price increases were sustained over five consecutive months). Between January 2005 and July 2012, there were 247 cases in which two or more countries within the same region or subregion had a price increase higher than 15% in the last five months. Of those, there were no circumstances in which a country had no macro vulnerability measured by the criteria described above: most countries had more than one.

Table 3
Incidence of domestic alerts (ranked by average staple price increase). *Source*: Authors' compilation.

Region	Countries	Date	Staple	Average staple price increase (%)	Number of countries with macro vulnerabilities	Number of macro vulnerabilities
SSA-Eastern	SDN, ETH, KEN, UGA	July, 2008	S, M, M, M	90	4	12
SSA-Southern	MOZ, MWI, ZMB	March, 2008	M, M, M	83	3	9
SSA-Eastern	TZA, ETH, SOM, UGA, KEN, RWA	July, 2011	M, M, M, M, M, M	81	6	15
LAC	CRI, NIC	March, 2009	R, M	80	2	5
SSA-Eastern	UGA, SDN, KEN, ETH	June, 2008	M, S, M, M	77	4	12
LAC	NIC, HND, CRI	May, 2009	M, M, R	76	3	8
LAC	HND, CRI, NIC	April, 2009	M, R, M	75	3	8
SAR	PAK, AFG, LKA	April, 2008	W, W, R	65	3	6
SSA-Eastern	ETH, TZA, SOM, KEN, UGA, RWA	May, 2011	M, M, M, M, M, M	64	6	15
SSA-Eastern	SOM, KEN, UGA, ETH, RWA, TZA	June, 2011	M, M, M, M, M, M	64	6	15
SSA-Eastern	KEN, SOM, TZA, ETH, RWA, UGA	April, 2011	M, M, M, M, M, M	63	6	15
SSA-Eastern	TZA, MDG	November, 2007	M, R	62	2	6
SSA-Eastern	KEN, SDN, TZA, RWA, ETH, UGA	May, 2008	M, S, M, M, M, M	62	6	18
EAR	THA, KHM, MNG, PHL	April, 2008	R, R, W, R	61	4	9
SSA-Eastern	RWA, UGA, SOM, TZA, MDG	January, 2011	M, M, M, M, R	61	5	13
LAC	NIC, CRI	February, 2009	M, R	60	2	5
SSA-Eastern	SDN, MDG, RWA, BDI, UGA, TZA	January, 2008	S, R, M, B, M, M	57	6	17
SSA-Southern	ZMB, MOZ, MWI	February, 2008	M, M, M	57	3	9
EAR	LAO, MNG, PHL, KHM, THA	May, 2008	R, W, R, R, R	57	5	12
SSA-Eastern	UGA, ETH, MDG, KEN, RWA, SOM	March, 2011	M, M, R, M, M, M	57	6	15
SSA-Southern	ZMB, MWI	April, 2008	M, M	56	2	6
SSA-Eastern	RWA, ETH, SDN, UGA, KEN	August, 2008	M, M, S, M, M	56	5	15
LAC	GTM, HND, NIC, SLV, MEX	April, 2011	M, M, M, M, M	56	5	13
SAR	LKA, NPL, PAK, AFG	January, 2008	R, R, W, W	54	4	8
EAR	KHM, LAO, THA, MNG, PHL	June, 2008	R, R, R, W, R	54	5	12
LAC	SLV, NIC, GTM, HND, MEX	May, 2011	M, M, M, M, M	54	5	13
SSA-Eastern	BDI, TZA, MDG	December, 2007	B, M, R	53	3	9
SSA-Eastern	ETH, UGA, TZA, KEN, RWA, SOM	August, 2011	M, M, M, M, M, M	53	6	15
SSA-Western	MLI, BEN, CPV, MRT, NGA, GHA	November, 2007	Mi, M, W, W, S, M	52	6	17
SSA-Western	SEN, GHA, BEN, MRT, NGA, TGO	February, 2008	R, M, M, W, S, M	52	6	17

Note: B = barley; C = cassava; M = maize; Mi = millet; R = rice; S = sorghum; W = wheat. Macro vulnerabilities: D = public debt; C = current account; F = fiscal deficit; R = reserves. Djibouti is part of the Middle East and North Africa, according to World Bank classification, not part of eastern Africa.

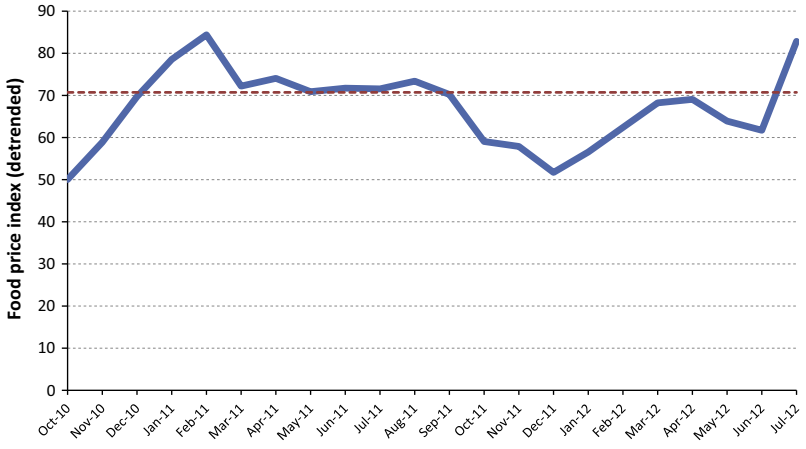

Fig. 2. Monthly global food prices, 2011–12. *Source*: Authors' illustration using World Bank (2012a) data.

By regions, East Africa, Latin America, and West Africa had many alerts, 49, 51 and 54, respectively, distantly followed by southern Africa, 28; ECA, 26; South Asia, 20; and EAP, 19. To put these numbers in context: out of a total of 91 months between January 2005 and July 2012, there were 47 during which at least two East African countries had price increases exceeding 15% in over a five-month period (see Appendix B online for a full list).

Evidence also shows that there are many countries involved in the alerts in the regions of Latin America, and East and West Africa (although not all [LAC] countries are IDA). In other regions, there is a more concentrated sample of countries with alerts. Also, price alerts were triggered largely by wheat in ECA, maize in LAC and southern Africa, and rice and wheat in East and South Asia. In contrast, the prices of multiple staples triggered alerts in East and West Africa. The incidence of macro vulnerabilities is similar to the incidence of food price alerts, with more macro vulnerabilities concentrated in the three regions with more food staple price alerts. Current account imbalances appear more frequent, and, on average, each country in Appendix B has about two macro vulnerabilities, an average that is uniform across regions.

Table 3 presents the top 30 alerts in terms of highest staple food price increase observed. It also highlights episodes around the peaks of 2008 and 2011, which allows comparison of results from the global stage monitoring with those of the national stage. The analysis shows that the selected triggers seemed to perform well, that is, they picked up the peaks in 2008 and 2011. Triggers have

Table 4
Domestic alerts for the food price crisis in 2011 and 2012. *Source*: Authors' compilation.

Region	Countries	Date	Staple	Average staple price increase (%)	Number of countries with macro vulnerabilities	Number of macro vulnerabilities	Vulnerabilities per country	Score	Ranking
ECA	GEO, TJK, KGZ, AZE, UKR	January, 2011	W, W, W, W, W	22	5	13	2.6	10	47
LAC	CRI, BRA, BOL, HND, SLV	January, 2011	R, W, M, M, M	27	5	13	2.6	12	39
SSA-Eastern	RWA, UGA, SOM, TZA, MDG	January, 2011	M, M, M, M, R	61	5	13	2.6	23	5
ECA	KGZ, AZE, TJK, MDA, UKR	February, 2011	W, W, W, W, W	19	5	13	2.6	9	49
LAC	CRI, HND, SLV	February, 2011	R, M, M	39	3	9	3.0	15	23
SSA-Eastern	RWA, TZA, MDG, KEN, SOM, UGA	February, 2011	M, M, R, M, M, M	45	6	16	2.7	18	13
SSA-Southern	ZMB, ZAF	February, 2011	M, M	20	2	5	2.5	8	54
ECA	MDA, UKR, KGZ, AZE	March, 2011	W, W, W, W	31	4	11	2.8	13	33
LAC	GTM, CRI, HND, NIC, SLV	March, 2011	M, R, M, M, M	46	5	14	2.8	18	12
SSA-Eastern	UGA, ETH, MDG, KEN, RWA, SOM	March, 2011	M, M, R, M, M, M	57	6	15	2.5	22	6
SSA-Western	GHA, TGO	March, 2011	M, M	25	2	6	3.0	10	44
ECA	KGZ, UKR, GEO, MDA	April, 2011	W, W, W, W	29	4	12	3.0	12	37
LAC	GTM, HND, NIC, SLV, MEX	April, 2011	M, M, M, M	56	5	13	2.6	21	7
SSA-Eastern	KEN, SOM, TZA, ETH, RWA, UGA	April, 2011	M, M, M, M, M, M	63	6	15	2.5	24	4
SSA-Western	TCD, NER, GHA, BEN	April, 2011	M, Mi, M, M	33	4	12	3.0	13	28
ECA	GEO, MDA, UKR, KGZ	May, 2011	W, W, W, W	24	4	12	3.0	10	42
LAC	SLV, NIC, GTM, HND, MEX	May, 2011	M, M, M, M, M	54	5	13	2.6	21	8
SSA-Eastern	ETH, TZA, SOM, KEN, UGA, RWA	May, 2011	M, M, M, M, M, M	64	6	15	2.5	24	2
SSA-Western	TCD, NGA, BEN, GHA, NER	May, 2011	M, S, M, M, Mi	31	5	15	2.8	13	32
ECA	UKR, MDA	June, 2011	W, W	32	2	6	3.0	12	34
LAC	NIC, SLV, HDN, GTM	June, 2011	M, M, M, M	51	4	11	2.8	19	10
SSA-Eastern	SOM, KEN, UGA, ETH, RWA, TZA	June, 2011	M, M, M, M, M, M	64	6	15	2.5	24	3
SSA-Western	GHA, NGA, TCD, BEN	June, 2011	M. S, M, M	39	4	11	2.8	15	21
LAC	NIC, SLV, HDN, GTM	July, 2011	M, M, M, M	50	4	11	2.8	19	11
SSA-Eastern	TZA, ETH, SOM, UGA, KEN, RWA	July, 2011	M, M, M, M, M, M	81	6	15	2.5	30	1
SSA-Western	GHA, BEN, TCD, NGA	July, 2011	M, M, M, S	37	4	11	2.8	15	24
EAR	KHM, THA	August, 2011	R, R	16	2	5	2.5	7	55
LAC	NIC, GTM, HDN, SLV	August, 2011	M, M, M, M	39	4	11	2.8	15	22
SSA-Eastern	ETH, UGA, Tza, KEN, RWA, SOM	August, 2011	M, M, M, M, M, M	53	6	15	2.5	21	9
SSA-Western	BEN, TCD, GHA, NGA	August, 2011	M, M, M, S	44	4	11	2.8	17	14
EAR	KHM, THA	September, 2011	R, R	22	2	5	2.5	9	50
SSA-Western	BFA, TCD, NGA	September, 2011	S, M, S	20	3	8	2.7	9	52
EAR	KHM, THA	October, 2011	R, R	28	2	5	2.5	11	41
SSA-Eastern	ETH, SDN	October, 2011	M, S	42	2	4	2.0	15	19
SSA-Western	BFA, TCD, NGA	October, 2011	S, M, S	21	3	8	2.7	9	48
EAR	KHM, THA	November, 2011	R, R	22	2	5	2.5	9	51
SSA-Eastern	SDN, ETH, MDG	November, 2011	S. M, R	34	3	7	2.3	13	31
SSA-Western	BFA, MLI	November, 2011	S, Mi	32	2	6	3.0	12	35
SSA-Southern	ZAF, ZMB	November, 2011	M, M	30	2	5	2.5	12	40
SSA-Eastern	MDG, SDN	December, 2011	R, S	43	2	5	2.5	16	17
SSA-Western	BFA, NER, MLI	December, 2011	S. Mi, Mi	40	3	9	3.0	15	20
SSA-Eastern	MDG, SDN	January, 2012	R, S	35	2	6	3.0	13	29
SSA-Western	BFA, SEN, MLI, NER	January, 2012	S, R, Mi, Mi	30	4	12	3.0	12	36
SSA-Eastern	TZA, SDN	February, 2012	M, S	44	2	6	3.0	16	15
SSA-Western	NER, GHA, SEN, BFA, MLI	February, 2012	M, M, R, S, Mi	35	5	15	3.0	14	25
SSA-Eastern	TZA, SDN, UGA	March, 2012	M, S, M	24	3	9	3.0	10	45
SSA-Western	NER, GHA, BFA, MLI	March, 2012	M, M, S, Mi	33	4	12	3.0	13	30
SSA-Eastern	UGA, TZA, SOM, SDN	April, 2012	M, M, M, S	41	4	10	2.5	16	18
SSA-Western	BFA, NER, MLI, GHA, NGA	April, 2012	S, Mi, Mi, M, S	33	5	14	2.8	14	27
SSA-Eastern	SOM, SUD, TZA, UGA	May, 2012	M, S, M, M	43	4	7	1.8	16	16
SSA-Western	CHA, GAB, MAL, NGA, SEN	May, 2012	Mil, C, Mil, S, R	31	3	4	1.3	12	38
SSA-Eastern	ETH, RWA, SUD, UGA	June, 2012	M, M, S, M	36	4	8	2.0	14	26
SSA-Western	CHA, MAL, NIG	June, 2012	Mil, Mil, Mil	26	3	4	2.0	10	43
SSA-Eastern	RWA, SUD	July, 2012	M, S	26	2	4	2.0	10	46
SSA-Western	BUR, MAL, NIG	July, 2012	S, Mil, Mil	20	3	5	2.0	8	53

activated alerts in April, May, June, and July of 2008 in South and East Asia and eastern and southern Africa, corresponding to the period leading up to the 2008 food price crisis. Interestingly, these are all regions where rice is the main staple food item, particularly in urban areas. The Horn of Africa food crisis during summer 2011 is also captured, because the trigger would have been activated for a large number of countries in the region from as early as April 2011 to August 2011. Note that this analysis further emphasizes the less obvious finding that there are many periods for which domestic triggers would have picked up local price escalations even when global triggers remained inactive. Consider the example of LAC countries in the months of March to May 2009, that was the period when global prices were easing off, but there were pockets in LAC where prices of rice and maize had notably increased. This is a reflection of the distinctive effects of domestic and global shocks driving high and volatile prices and highlights the need to have both global and domestic triggers in place.

Applying the monitoring framework: 2011 and 2012

The analysis then zeros in on January 2011 to July 2012, the latest period for which data were available. At the global level, using 3

SD of the detrended series spanning 1960–2006 as the threshold, the trigger for global food prices would have activated an alert in January 2011 until September 2011, and then would have sounded another alarm in July 2012 (Fig. 2).

At the domestic level, alerts are described in Table 4, along with the characteristics of the vulnerabilities observed to provide an indication of the severity of the situation. In total, 58 alerts would have been triggered for two or more countries in the same subregion or region from January 2011 to July 2012. Eighteen of these cases are from East Africa, 19 from western Africa, 8 from Latin America, 6 from ECA, 4 from eastern Asia, and 3 from southern Africa Table 4 also highlights potential ways to prioritize the triggered episodes. In the simplest case, the analysis can prioritize among episodes within the same month by the number of countries involved or the average staple price increase. In its last two columns, Table 4 reports a score and the ranking resulting from that score. This score is constructed by averaging (with equal weights) the average price increase, the number of countries involved, and the average number of macroeconomic vulnerabilities per country (to avoid over-representing the number of countries involved) associated with that episode.

Results reassuringly show that numerous regions in the world would have triggered an alert, which substantiates the global nature of the food price hikes that spiked in February 2011. The system would have also picked up on the Horn of Africa disaster, which involved many countries in the subregion, and would have sounded the alert as early as February 2011. In fact, there would have been alerts from February to July 2011 for many countries in that subregion. Finally, the framework would also have sounded the alert for western Africa in 2012 in regards to the unfolding crisis in the Sahel region.

Conclusions

This paper has related serious delays in the international community's responses to recurrent food crises to the lack of consensus definition on what constitutes a food crisis and to the focus on (a relatively small number of) specific countries covered by existing information systems. These analytical aspects have been mostly overlooked by the scarce literature assessing food security information systems. But they help explain—in addition to operational aspects—why information systems with similar objectives, similar sources of information, and, in some cases, similar classification procedures have not worked as smoothly as food insecurity crises demand. While existing systems provide vast amounts of data, information and analysis related to food security at different levels, none has the capacity to simultaneously monitor global and national level key indicators and sound the alarm without extensive and laborious assessment.

Because of this gap, this paper proposes an alternative monitoring system that aims to enable early detection of unfolding food security crises in the most vulnerable—IDA—countries, built upon a notion of vulnerability and more narrowly focused on price-related food crises. Vulnerability is captured by the degree of exposure to international food price shocks and domestic food price spikes at the national level on the one hand, and by the degree of macroeconomic capacity to mitigate their effects at the national level on the other hand. Price-related food crises refer to the subset of crises that are driven by sudden spikes of food prices, typically at a global level. Even though this is only a partial set of crises, three considerations underscore its relevance: first, the framework is expected to capture price-related drivers, but also drivers other than prices that are reflected or conveyed by prices. Thus, a huge increase in public debt that will affect the capacity of a country to import food will be considered in the second stage of the framework. The hypothetical resulting reduction in food imports, for example, is not considered a shock, but the effect of the debt shock. As a result, global food—and, similarly, oil—prices are considered both shocks and transmission mechanisms from other global shocks into national food insecurity. Second, since 2007, price-related food crises have been the most recurrent and significant in terms of people affected globally in the context of domestic food crises. Third, the framework is also able to capture other crises not related to prices, such as the Horn of Africa famine. Part of the reasons for these results is that, contrary to the previous systems, the proposed framework consists of two fully integrated components, the global and domestic stages. It proposes an empirical definition of food crises that is flexible and easy to operationalize and monitor, based on observed trends rather than on a conceptual definition that has proven vague in the past. The framework maximizes frequently available and relevant data. Rather than attempting to solve analytical or operational issues (such as, for instance, whether responses should be different in transitory and chronic situations), it focuses instead on single channels, clearly conceptualized.

The calibration exercise using a wide set of indicators concluded that the trigger defined as 3 SD from the detrended 1960–2006 historical mean of the FOPI is the best-performing trigger to identify the 2008 and 2011 international food price peaks; it minimizes the number of false positives and provides time for preparation before the crisis peak. At the national stage, the best-performing threshold was a combination of increases of 15% or more during a period of five months and at least one macroeconomic vulnerability across fiscal, debt, foreign reserves, and current account balances. The trigger activates numerous alerts around the peaks in 2008 and 2011, with episodes in East and West Africa involving the largest number of countries. This trigger also picked up the Horn of Africa food crisis during summer 2011. Importantly, episodes involving a large number of countries that activated triggers were observed in southern Africa, Latin America, and Eastern Europe in periods between peaks. This confirms the distinctive effects of domestic and global shocks driving high and volatile prices and, ultimately, the need to have both global and domestic triggers in place.

There are still a number of limitations to the current framework and potential extensions have been suggested to overcome these limitations. First, the analysis was conducted for a relatively small set of countries, some 63 countries for which FAO data on staples were available. Some regions, like the Middle East and North Africa, are very poorly represented. A first extension would therefore consist of expanding the list of countries and the number of staples considered. More efforts to capture and manage country-specific food inflation information are needed to achieve this global public good. Second, the framework focuses on prices as the origin and transmitter of crises. Yet, there are other many factors that can shape and determine a food security crisis. So, if the framework is also going to cover additional risks and drivers to crises, additional variables will be required. One possibility is to tap into already existing mechanisms such as the FEWS NET or others used in preparation of the Agricultural Market Information System (AMIS, 2011). Alternatively, the framework may focus on updated variables that clearly have a bearing on future events, such as stocks-to-use ratios, or factors that clearly constrain the ability of countries to prepare and respond to crises, such as, for example, trade, social protection, risk management and legal considerations, if data quality is considered sufficient. Third, if the framework becomes operational, it must articulate its institutional setting, including the allocation of technical roles among established (or new) structures; decisions on communication, coordination, and activation of response mechanisms; and other aspects of decision-making processes. The current international architecture to prepare and respond to food crises—price related or otherwise—is dominated

by specific agencies and donors with different mandates and modus operandi, from humanitarian and emergency response to postcrisis reconstruction. The proposed framework does not seek to change this architecture or the mandates of specific agencies, but rather provide a common language that is simple, accessible to everyone, and using existing available information to (i) enable the international community to better prioritize resources and prepare earlier and (ii) allow countries to have the same information and analytical diagnoses used by donors and multilateral stakeholders, thus leveling the playfield of information, analysis, and evidence-based decision making.

Appendix A. Supplementary material

Supplementary data associated with this article can be found, in the online version, at http://dx.doi.org/10.1016/j.foodpol.2014.06.001.

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