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Tomorrow's hunger: A framework for analysing vulnerability to food security

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Tomorrow's Hunger

A Framework for Analysing Vulnerability to Food Security

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October 2006

Abstract

Whilst traditional food security analysis offers an ex post view on who the food insecure are and why they are so, looking at food insecurity from a vulnerability perspective provides a dynamic and forward looking way of analysing causes and more importantly options for reducing food insecurity. This can help improving policy responses to food insecurity. The paper seeks to expand a standard food security analytical framework by including risks and the ability at different levels to manage these to reduce the probability of people being food insecure in the future. It looks at how different shocks can impact on availability, access and utilization and, using a twin-track approach, identify policy options for reducing vulnerability.

Keywords: food security, vulnerability, poverty, livelihoods, risks, risk management

JEL classification: D18, I31, I32, 013

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1 Introduction

The Millennium Development and World Food Summit Goals of halving the number/share of undernourished by 2015 are only 10 years away, but progress towards them is slow. The number fell only by a total of nine million over the last decade and, more worryingly, four million people were added per year in the second part of the decade, wiping out earlier achievements. The latest figures suggest that 815 million are undernourished (FAO 2004). Whilst no comparative estimate exists on the number of vulnerable people, several studies related to income or consumption poverty point out that the number of vulnerable people is much larger.

Reducing vulnerability is a prerequisite for addressing global and national food security targets. This is because policies and interventions seeking to reduce the number of undernourished or the prevalence of underweight children under five years of age will be more effective if based on a forward-looking analysis: Who are those most likely to be food insecure *in the future*, why are likely they to be or to become so and what instruments exist for influencing this probability.

Frameworks for integrating longer-term vulnerability into food security analysis are largely absent (Haddad and Frankenberger 2003; Webb and Rogers 2003) and most existing vulnerability analyses, often applied in the context of early warning information systems, focus on transitory risks.[1] Less emphasis is placed on identifying and analysing the potential longer-term food security impact of risks, which require a set of interventions different from humanitarian responses.

Whilst some existing food security frameworks (Smith, Obeid and Jensen 2000; Commission on the Nutrition Challenges 1999; FIVIMS 2000) identify a range of multisectoral food security risks, these often assume a direct causal relationship between risks and food security outcomes and are static. Risks are treated as exogenous, thus putting aside the range of risk management strategies that are used for attenuating the impact risks have on food security.

Over the last five years, frameworks for analysing vulnerability to negative social welfare outcomes in general (Holzmann and Jørgensen 2000), and specifically income and consumption poverty (Mansuri and Healy 2001; Dercon 2001a), have been developed. These frameworks are geared towards identifying those who are likely to have an income below a certain threshold and as such are helpful in analysing the access dimension of food security, but less so when it comes to the availability and utilization dimensions. There are, of course, strong linkages between poverty and food insecurity, but the causes and consequences of each are different (Webb and Rogers 2003).

This paper seeks to fill this analytical gap by providing a framework for understanding who is likely to be food insecure in the future and why this is so, with the overall aim of improving the ability to address vulnerability before it manifests itself as food insecurity.

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[1] Examples of these include Save the Children's Household Economy Approach and WFP's Standard Analytical Framework

The paper is structured in the following way: section 2 clarifies conceptual issues and presents an expanded food security framework for understanding vulnerability. Section 3 explains the role that present conditions play in determining vulnerability. The risk side is analysed in section 4, whilst risk management is addressed in section 5, where instruments for reducing vulnerability are also presented. Finally, section 6 presents the main conclusions of the paper.

2 Concepts of food security and vulnerability

2.1 What are food insecurity and vulnerability?

Following a number of international summits since the World Food Conference in 1974 and based on work over several decades, the definition of food security is today generally agreed upon. The World Food Summit in 1996 captured earlier work by adopting that *food security exists when all people at all times, have physical and economic access to sufficient, safe and nutritious food to meet their dietary needs and food preferences for an active and healthy life* (FAO 1996). This definition integrates access to food, stability, availability of nutritionally adequate food and the biological utilization of food.

Food availability refers to the physical presence of food at various levels from household to national level, be it from own production or through markets. *Food access* refers to the ability to obtain an appropriate and nutritious diet and is in particular linked to resources at the household level. *Biological utilization* relates to individual level food security and is the ability of the human body to effectively convert food into energy.

The 'at all times' and *stability* dimensions point to the need for understanding current as well as likely future status at different points in time. Thus, a framework for analysing food security must capture the temporal dynamics of food security.

The concept of vulnerability is used with different connotations. A fundamental difference exists between *vulnerability as defencelessness vis-à-vis a harmful event* (for example, vulnerability to drought) and *vulnerability to a specific negative outcome, following a harmful event* (for example vulnerability to food insecurity).

Much of the disaster management literature uses vulnerability with reference to a natural hazard (Alwang, Siegel and Jørgensen 2001) whilst the food security literature, and more recently part of the social risk management and poverty literature (Mansuri and Healy 2001; Dercon 2001a; Holzmann and Jørgensen 2000; World Bank 2000), defines vulnerability in terms of an unfavourable future outcome. This dichotomy is, to some extent, driven by the underlying policy questions that are sought to be addressed. Humanitarian aid and disaster management tend to focus on short-term responses targeted at people who require relief assistance following a natural hazard, these being the vulnerable. Looking at vulnerability relative to a social welfare outcome, on the other hand, is concerned with guaranteeing a minimum welfare threshold in terms of food security, through short as well as longer-term measures.

We define vulnerability relative to the negative outcome of food insecurity. Thus, vulnerability refers to people's propensity to fall, or stay, below this food security threshold within a certain timeframe.

The terms ‘vulnerability’ and ‘food insecurity’ are often used interchangeably. This matters less when focusing on short-term unstable conditions, where there is little or no difference between those being food insecure today or tomorrow. However, over longer periods of time, people move in and out of food insecurity. Thus, while vulnerability refers to the ex ante probability of falling or remaining below a specific threshold, food insecurity is the current or ex post measure relative to the threshold.

Because vulnerability is linked to the uncertainty of events, everyone is vulnerable to food insecurity, but some more so than others. Vulnerability can be thought of as a continuum. The higher the probability of becoming food insecure, the more vulnerable one is. While ‘the vulnerable’ in praxis are often implicitly understood to be those with a probability of becoming food insecure above a certain predetermined threshold, no standard exists that defines this threshold.[2] For the purpose of this paper we assume that a cutoff point exists and so the term vulnerable refers to people below such predetermined threshold.

2.2 Why the little difference matters

Expanding the analysis of food security to include risks and risk management, and focusing on vulnerability is important for several reasons.

First, numerous studies on poverty dynamics suggest that people move in and out of poverty. Summing up 13 panel data studies, Baulch and Hoddinott (2000) show that the share of the population being poor at times is often much larger that the share being always poor, and in some cases several times larger. If vulnerable is understood as the probability of experiencing at least one period of poverty in a given period, whilst 3 per cent in Pakistan comparing 1986 and 1991 were always poor, 55.3 per cent were sometimes poor making 58.3 per cent vulnerable. Following the same definition of vulnerability, Pritchett, Suryahadi and Sumarto (2000) shows that in Indonesia at the level of current poverty of 20 per cent, another 10-30 per cent of the population face a high probability of falling below the poverty line.

Table 1, based on per capita consumption expenditures from KwaZulu-Natal in South Africa in 1993 and 1998, gives an example of how people moved in and out of consumption poverty. Eighteen per cent of households were poor in both periods, whilst 48 per cent were nonpoor in both time periods; 10 per cent of households got ahead and 24 per cent fell into poverty.

Table 1
Poverty dynamics due to consumption shocks in KwaZulu-Natal, South Africa

		1998	
		Nonpoor	*Poor*
1993	*Nonpoor*	48% never poor	24% became poor
	Poor	10% got out of poverty	18% stayed poor

Source: Adapted from Carter and May (2001).

2 To illustrate, Tesliuc and Lindert (2002) use a 50 per cent probability as the cutoff point implying that being vulnerable means facing a higher probability of being food insecure than being food secure.

The implication of all this is that basing interventions on a snapshot at a given time will most likely miss a large part of the picture.

Second, the food insecure and vulnerable are not homogenous groups. Some are chronically food insecure, others transitorily so and others again food insecure on a seasonal basis—and for different reasons. These are important distinctions since the causes of, and policy measures, for addressing transitory food insecurity may be different from those associated with chronic food insecurity (Barrett and Sahn 2001).

Third, the presence of risks influences livelihood choices. High risk adversity can lead to income earning strategies with low variability but often also low mean returns. Reducing the potential impact of shocks, e.g., through provision of social benefits under certain conditions, allows households to make productivity enhancing-investments perceived riskier.

Finally, vulnerability analysis identifies ex ante as well as ex post interventions, thus partly shifting the focus of interventions from addressing an already manifested negative outcome (coping) to addressing problems before they actually arise (prevention or mitigation).

2.3 A framework for analysing vulnerability to food insecurity

Being food insecure today does not necessarily imply vulnerability. Chronically food insecure people live below the food security threshold today. Potentially food insecure people are 'living on the edge'. Although they are not food insecure today, they face a high probability of becoming so (see Table 2).[3]

Figure 1 presents a causality framework for identifying the factors determining the probability of negative food security outcomes in the future. The probability of becoming food insecure at a future point in time is determined by present conditions, the risks potentially occurring within a period defined and the capacity to manage these.

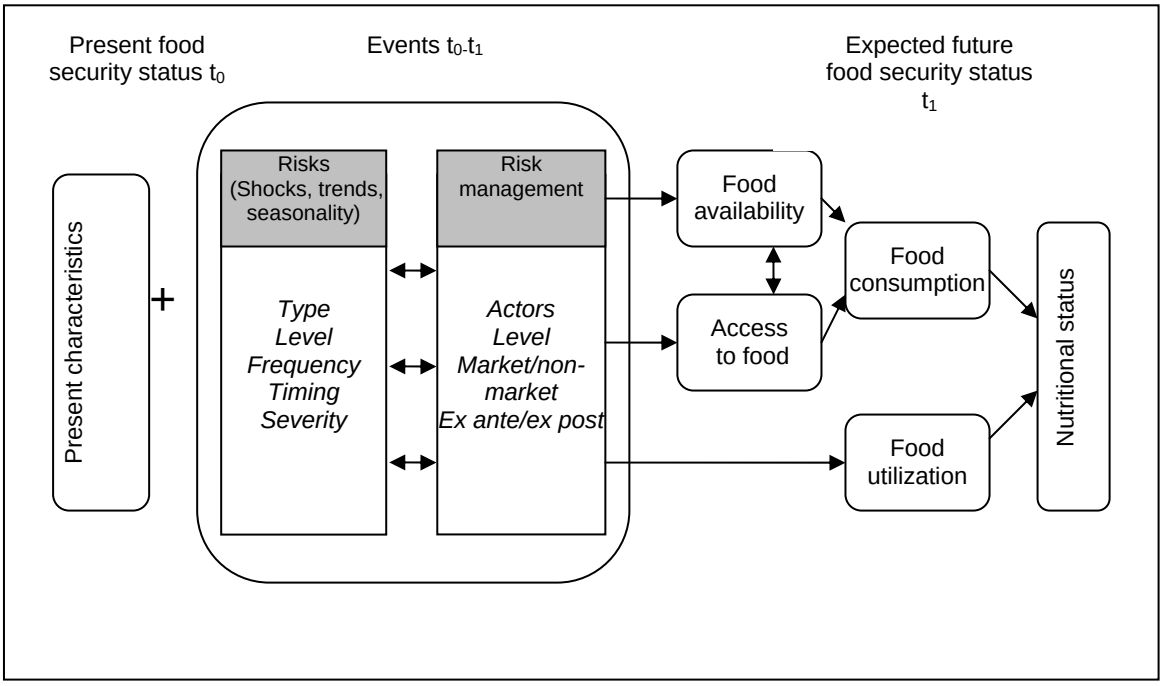
Table 2
Present and future food security

		Expected future food security status	
		Food secure	*Food insecure*
Present food security status	*Food secure*	Food secure	Potentially food insecure
	Food insecure	Potentially food secure	Chronically food insecure
Vulnerable/nonvulnerable		*Nonvulnerable*	*Vulnerable*

Source: Compiled by the authors.

3 Dercon (2001a, 2001b) makes a further categorization of the potentially vulnerable into those who are potentially insecure following an unexpected shock, those who are potentially following cyclical/seasonal shocks and those who are potentially food insecure due to negative trends for example negative changes over time in key food security factors.

Figure 1
A framework for analysing vulnerability to future food insecurity



Source: Compiled by the authors.

Vulnerability is determined by a cumulative chain of events through time. What happened yesterday is reflected in today's status and what happens today influences tomorrow's status and so forth. As well as connections through time, there is an inter-relationship between risk management instruments at different levels (global, national, community, household and individual). For instance, the presence of a functioning state-sponsored safety-net programme lowers the need for individual insurance against economic or health shocks. There can also be crowding-in effects, if risk management instruments at one level create an environment that stimulates activities at other levels. In 1998, the government of Bangladesh accelerated trade liberalization policies by removing rice import tariffs, minimizing government open-market price sales, and speeding up customs procedures. This encouraged the private sector to play an important role in guaranteeing national food availability through private sector imports during the major 1998 floods (del Ninno *et al.* 2001).

2.4 Measuring vulnerability

Although not the focus of this paper, this section briefly discusses measuring of vulnerability.[4] While much of the work on vulnerability has been of a contextual or qualitative nature, we focus in this section on what to quantify in terms of vulnerability to food insecurity.

In the same way as no single measure of food security exists (FAO 2002), there is no unique approach to measuring vulnerability to food insecurity. Such a measurement must be related to a specific dimension of food security or a nutritional outcome.

4 For a detailed treatment of the subject, see Dercon (2001b).

Regardless of the choice of dependent variable, the measurement must be based on information about assets and livelihoods, risks faced, options available for addressing different risks and more importantly, possible future states of the world and their likely probabilities.

One set of existing measures focuses on predicting shortages in food availability, seeking to forecast seasonal variations in food production through crop, drought and flood monitoring. Such work also includes longer-term food production scenarios focusing on specific risks, such as environmental changes. As food availability in particular is related to the national or sub-national level, the question becomes whether, at the aggregated level, there is sufficient food available to meet aggregate demand, ignoring that food is not distributed or accessed equally or that availability of food may not be the binding constraint for achieving food security.

Another approach is to measure the probability of falling under a specific income or consumption threshold, in line with many of the studies related to vulnerability to poverty, based either on cross-sectional or panel data (Pritchett *et al.* 2000; Vakis, Kruger and Mason 2004). This allows to measure whether people are likely to have enough food under certain assumptions about food availability and prices. However, it does not contain information on diet composition, access to micro-nutrients etc. An alternative access based indicator is to measure how much 'buffer' there is in current income as regards to increasing food expenditure. Vulnerability would thus be the probability of food expenditures as a share of total expenditures above a certain level (Engel coefficient). A more indirect approach is to use asset values as proxies for the ability to withstand shocks, assuming that the more assets people have, the less vulnerable they are.

Finally, measuring the probability of a negative nutritional outcome, e.g., underweight of children under five, wasting or stunting encompasses all dimensions of food security, including food utilization, but pick up other factors as well. Apart from including health and care practices, (i.e., a well-fed child can be wasted due to diarrhoea), anthropometric indicators record both acute (wasting) and chronic malnutrition (stunting) or a combination of both (underweight).

3 Understanding present conditions

Present conditions play a role in determining which risks threaten food security and how effectively these can be managed. Of relevance to vulnerability is food security status, asset portfolio, the livelihood-related activities people are engaged in (for example, food production, income generation and healthcare practices) and the context within which people are embedded

3.1 Food security status

Present food security status can indicate how far people have to climb or fall before their food security status changes. Although major falls into food insecurity or jumps out of food insecurity are possible, those who are well above the minimum threshold and those who are well below the threshold are less likely to cross this within a short

timespan. For those living close to the minimum threshold, even a small push can make them change status.

Present food-security status also has important intertemporal effects. Undernourished mothers are more likely to give birth to children with low birth weight, whilst malnourished children tend to have lower educational attainments and reduce income earning potential.

3.2 Livelihood assets and activities

The livelihood activities that people pursue are based on the quantity and quality of assets that they have access to. Assets can be of various types (social, financial, physical, natural and human) and be privately or publicly held. Assets are important to risk management as tools for smoothening consumption. Different households have different levels of access to assets, influencing their ability to prevent, mitigate or cope with shocks.

The types of risks that form a threat to people's food security is also a function of their livelihoods. For example, communities relying on access to forests will be more affected by policy reform affecting forest access or forest depletion than urban-area rickshaw drivers.

The characteristics of assets which contribute to determining risk management capacities include the security of access and use; the rate and volatility of returns and their ability to maintain value during crisis; the ease with which assets can be liquidated or traded; and the absence of markets.

3.3 Policies, institutions, organizations

The access to assets, the use thereof and the expected returns to these are influenced by the policy, the institutional and the organizational environment within which people are embedded. Policies provide a framework that constrains or supports the role played by institutions or organizations. Institutions refer to the 'rules of the game' which include established sets of rules, legislation, norms and patterns of behaviour. They determine the context within which organizations operate; the activities that can legitimately be undertaken; the relationships within organizations; and relationships between organizations and the public. Institutions can be formal (include laws, constitution, treaties, regulations, and established rights at international, national and subnational levels) and informal (e.g., gender relations or caste).

Organizations are the 'players' or service delivery structures in private, public and civil society spheres at different levels. They include political bodies (political parties, a city council, a regulatory agency); economic bodies (firms, trade unions, co-operatives) and social bodies (churches, clubs, associations). These players have specific objectives based on, inter alia, self-interests, political power, ideology, perceptions of risks and their impacts and resources. If food security is not high on the agenda, neither will managing risks to reduce vulnerability.

4 Understanding threats to food security: the risk side

Risks are events, trends, and structural factors that threaten food supplies, access or utilization. This section looks at the defining characteristics of risks to determine how they are best managed.

4.1 Characteristics of risks

The defining characteristics of risks are *type, level, frequency, timing* and *severity*. These determine the potential impacts on food security of a specific risk, including which dimension(s) they affect.

Type

The types of risks that are perceived as impinging on future food security depend on the food security model adopted. Until the early 1980s, food security used to be associated with national food stocks and production, and consequently economic, environmental and natural risks were considered as the predominant threats to food security through their impact on national/sub-national food availability. Along with the increased acknowledgement of the importance of other dimensions of food security, a wider range of risks has become relevant when analysing vulnerability.

Risks can be clustered into various categories, including political risks, social risks, economic risks, health risks, natural risks, environmental risks and lifecycle related risks.

Different types of risks affect different people in different ways. While an economic shock in the form of a collapse in grain prices may be beneficial to net food buying urban or rural households at least in the short run, the impact on food surplus producing rural households will be negative.

Level

Risks affect different levels, be it individual/household (micro), community/regional (meso), national (macro) or global/regional (supra-macro). Meso, macro and supra-macro level risks, also referred to as covariant risks, have low inter-household variance and affect groups of households, livelihoods or even entire nations. Political, social, economic, health, natural and environmental risks often fall in this category. Micro-level risks, also referred to as idiosyncratic risks, have high inter-household variance. Lifecycle related risks fall in this category. The extent to which a risk is covariant or idiosyncratic largely depends on the causes of the risk—ill health can be an individual risk, or it can be covariate if the cause is a pandemic such as HIV/AIDS (World Bank 2000; Murdoch 1999).

Frequency and timing

Risks can be transitory, trend-related or structural. *Transitory* risks ‘come and go’ and include unpredictable events as well as cyclical/seasonal events, which can be more predictable. *Trends*, such as falling economic growth or declining agricultural yields, refer to the movement of variables over time. *Structural* risks are associated with long-term conditions that are rooted in the social, economic or political fabric.

Examples of these include discrimination against ethnic groups, or on the basis of gender or risks related to poor working conditions. Although unexpected transitory risks are more eye-catching, structural or regularly occurring transitory risks often have a greater role in determining people's vulnerability by gradually but continuously wearing away risk management capacities (Tesiluc and Lindert 2002; Devereux 2001).

The timing of negative events matters. Ability to manage risks differs seasonally, through life and within economic cycles. A single idiosyncratic shock may suffice to tumble an individual into food insecurity during times of hardship, while it could be easily handled during more buoyant times. This is especially relevant in the case of concatenated risks, striking with short intervals between them, or compounded risks, striking simultaneously, because they place a greater strain on risk management capacities. The 2001-02 drought in Southern Africa was less severe in terms of lack of rainfall than the 1991-92 drought but had far harsher consequences since it was compounded by political instability, an economic downturn, poor governance and HIV/AIDS (Heitzmann, Canagarajah and Siegel 2002; Baulch and Hoddinott 2000; Ellis 2002).

Severity

Negative events differ in strength or intensity (Holzmann and Jørgensen 2000). The severity of a flood is characterized by its coverage, duration, deviation from standard water levels or the number of people affected, whilst the severity of an economic shock may be measured by its duration, deviation from trend levels or sectors affected. The greater the severity of a risk, the greater the capacities required for managing it.

4.2 Types and levels of risks and links to food security

Table 3 provides an overview of the main risk types and their potential impact on the different dimensions of food security. For simplicity, risks have been associated with the main level of occurrence, but it is recognized that some risks are relevant to several levels.

At global and regional level, key threats to food security relate in particular to two factors. Macro-economic shocks, transmitted via flows of capital or goods, affect access to food through their impact on income and wealth of households and, together with global climate changes, can reduce food availability through changes in production incentives, increasing fluctuations and regional variance.

The main threats to food security at *national level* are political, economic and natural risks. In 2003-04, almost a third of all food emergencies (35) were caused by present or past conflicts, half of them caused by natural shocks, two caused by economic shocks and the remaining by a mix of causes. The causes of national level food emergencies have shifted over the last decade, with food emergencies caused by conflict or economic shocks growing from 15 per cent to 35 per cent (FAO 2004). These risks are often highly co-variant and influence food availability by their impact on food production, import/export and the pressure they put on food stocks. These risks can also increase transaction costs or isolate entire parts of countries, either because of damages to infrastructure or because of lack of security in specific areas. On the access side, most risks work through the pressure they put on real income, stemming from the erosion of

Table 3
Key risks and potential impact on food security

Types of risks	Availability	Access	Utilization
		Supra-macro (global, regional)	
Economic risks Financial crisis, trade related shocks	• Reduced import capacity • Changes in production incentives	• Reduced income and wealth • Reduced economic growth	• Falling public health expenditures
Natural risks Global climate changes	• Falling productivity of cropland	• Increased income variability • Increased pressure on resources for livelihood adaptation	• Increase in waterborne diseases
		Macro (national)	
Political risks Civil strife, war	• Lower production • Increased transaction costs • Breakdown in agricultural support system	• Reduced purchasing power (price, income)	• Breakdown of health-care system
Economic risks Growth collapse, fiscal or monetary crisis	• Food stock depletion • Reduced import capacity • Changes in production incentives • Falling public expenditures to support agricultural production, rural development	• Reduced purchasing power (price, income) • Reduced wealth	• Breakdown of health-care system
Natural risks Earthquakes, floods, droughts, desertification	• Lower production • Reduced livestock holdings • Pressure on food stocks	• Reduced income (agricultural, non-farm) • Reduced wealth • Reduced economic growth	• Reduced access to clean drinking water • Increase in waterborne diseases
		Meso (community)	
Political risks Civil strife, war	• Lower production • Increased transaction costs • Breakdown in agricultural support system		• Breakdown of health-care system
Natural risks Landslides, rainfall, high winds, pest attacks, livestock diseases	• Lower production • Increased pressure on natural resources • Increased year to year fluctuations and regional variance	• Reduced income (agricultural, non-farm) • Reduced purchasing power • Reduced wealth (livestock)	• Reduced access to clean drinking water • Increase in waterborne diseases

Table 3 continues

Table 3 (con't)
Key risks and potential impact on food security

Types of risks	Availability	Access	Utilization
		Meso (community)	
Environmental risks Deforestation, declining soil fertility	• Increased production costs		
Health risks Epidemics, HIV/AIDS, poor water and sanitation	• Lower food production	• Loss of working days (reduced income) • Increased non-food expenditures	• Reduced uptake of macro- and micronutrients • Exhaustion of health care systems leading to less treatment
Social risks Discrimination of access to common resources, social exclusion, loss of patronage	• Lower livestock production	• Reduced income diversification opportunities • Exclusion from informal insurance	
		Micro (household)	
Health risks Illness, disability, injury	• Lower own production	• Reduced income • Increased health costs • Reduced asset holdings (selling off) • Increased indebtedness	• Reduced uptake of macro- and micronutrients • Poor food utilization
Lifecycle related risks Old age, death, dowry	• Lower own production	• Reduced income • Increased health costs • Increased non-food expenditures • Reduced asset holdings • Increased indebtedness	
Social risks Inequitable intra-household food distribution		• Discriminatory access to food by certain household members (women or children)	• Transfer of malnourishment to children
Economic risks Unemployment, harvest failure	• Less own production	• Reduced income earned • Reduced asset holdings • Increased indebtedness	

Source: Adapted from World Bank (2000).

purchasing power and reduction in agricultural income, amplified by the absence of alternative income generating opportunities. Both the political and economic risks can erode the ability of the national governments—in some cases not even in existence—to provide national health care. Finally, earthquakes and floods and other natural shocks can result in increased water borne diseases, negatively affecting food utilization.

Apart from some of the above risks that may have particular subnational effects, natural, environment, health, and social related threats are the key risks affecting *groups of households or communities*. At this level, natural risks cause in particular higher variability in production as well as increased production costs related to higher losses, irrigation, treatment of infections and insecticides. Pending on the stock levels and the ability of traders to bring in food from other (non-) affected areas, this may or may not interrupt food supplies or lead to price increases. The key environmental risks are trends rather than shocks. They affect mean production negatively, in the case of declining soil fertility through lower yields but also through increased unit production costs. This limits the profitability of farming and the opportunities to earn income from other natural resource based activities. On the health side, the risk of epidemics, and increasingly HIV/AIDS, increase vulnerability. WHO (2002) ranked unsafe water supply, sanitation and hygiene the third most important risk leading to poor health and death in 2000. In developing countries, the main burden of such risks falls on children, increasing their immediate food insecurity. However, these health-related risks also increase vulnerability by reducing educational achievements because of higher absence and lower cognitive capacity due to poor nutritional status. Health risks imply loss of labour time either periodically or permanently, meaning lower income and less food access, reduced ability to absorb both macro- and micronutrients, and in cases where a large part of a community is affected, reduced food production locally. Social risks relate to the lack of access to common resources and informal networks in times of difficulties, leading to lower income earnings and seclusion from drawing on community resources.

At the *household level*, risks (health, lifecycle related, social and economic) primarily affect the access to food and food utilization. For households based on subsistence farming without alternative income source or no access to markets, such shocks can also reduce food availability. Lifecycle events, such as funerals or weddings, often imply significant extra expenditures, reducing the resources available for food purchase. Similarly, illnesses, disability and injuries involve additional expenditures, but also reduce labour supply and income and can lead to poor food utilization. Economic risks can reduce the access to food through the loss of income, either as a result of unemployment, or because income-generating activities, be it farming, small trade or manufacturing, fail.

Whilst some of these risks relate to the household per se, members of households are also faced with individual risks. In addition to lifecycle events, a set of risks relates to individual food access. Sufficient aggregated access to food at household level does not imply that all individual household members access food in proportion to their needs. Discrimination on the basis of gender or age can make individuals vulnerable, even if their household on an aggregate basis is not.

5 Dealing with threats to food security: the risk management side

Individuals, households, and communities are not passive victims of negative events, but seek to reduce vulnerability through risk management.[5] The effectiveness of risk management instruments depends partly on their suitability vis-à-vis the specific risks. Hence, identifying and analysing the instruments that are available for managing risks is an integral step in understanding people's degree of vulnerability and the causes of this. In the following sections, the characteristics of risk management instruments are analysed to understand their potential effectiveness in relation to ensuring food security.

5.1 Characteristics of risk management

Features of risk management instruments that need to be considered include their level, the actors involved, whether they are market or non-market based and whether they are ex ante or ex post.

Levels and actors

Risks can be managed at different levels, be it at the individual, household, community, (sub-) national or global level and at different levels simultaneous. Effectively managing risks requires the ability to share the burden either across time or between affected and non-affected people.

Instruments available at one level are often embedded in, and/or related to, instruments at other levels. Suppose that an effective way for managing a given idiosyncratic risk is through access to credit. Although the immediate response is at the individual level (taking a loan), the framework for providing financial services and the required financial resources need to be in place at the macro level. Thus, effective risk management can involve several levels simultaneously.

When it is not possible to spread the costs of risk management over time, risks that are covariant can be more difficult to manage locally as micro- and meso level support mechanisms are simultaneously affected. Thus, macrolevel interventions, which can draw from a wider pool of unaffected resources, are often better suited for managing covariate risks. Similarly, recurring or severe risks may require transfers beyond micro- and meso level capacities, requiring interventions at macro levels where actors can draw from a wider pool of resources (Gaiha and Imai 2003; Heitzmann, Canagarajah and Siegel 2002; Baulch and Hoddinott 2000).

The levels at which risks are managed are associated with specific risk management *actors.* Some of these actors operate at more than one level or switch between levels depending on the circumstances.

As the manifestation of food security ultimately is individual, any risk not managed by other actors falls back on individuals and households. These are mainly involved in

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[5] The ability to recover or resist being effected by an adversity is also termed resilience. However, to stress that options to influence future food insecurity include both ex post response capacity (ability to cope) as well as ex ante preventive or mitigating actions altering the characteristics of the risk itself (sometimes termed resistance), the term risk management is used here.

managing risks related to food access and utilization, and in the absence of functioning markets, also availability.[6] The degree of influence over household assets and income vary between household members, resulting in different degrees of vulnerability within a household. In times of food shortages, for example, women are often the first to reduce their own food consumption and redistribute part of their share of food to other household members. Whilst this may reduce the impact of a shock on particular members of a household, this is at the cost of other members food security (Murdoch 1995; Dercon 2002; Siegel and Alwang 1999).

The role of *community-based organizations (*CBOs) in managing risks, especially in the absence of formal safety nets, is well documented and related to all dimensions of food security. The 'Susu' schemes in West Africa, mutual support arrangements reinforced through celebration and rituals in South Asian countries, and burial societies in Andean countries are just some examples. CBOs assist households in mitigating and coping with risks and are sometimes used as vehicles for larger programmes sponsored by macro-level actors. Some CBOs also play a role in strategies aimed at preventing risks, for example through co-sponsoring local initiatives to develop infrastructure. Where traditional practices and norms are sources of risks, community based organizations can also be used for changing these (Marsh 2003).

The functioning of CBOs depends on the presence of social capital within communities and on principles of reciprocity. These solidarity bonds may be unevenly distributed and poorer households may be unable to reciprocate or to afford the ex ante investments (in social assets) required to benefit from these. As a result, some community members receive more support than others and some groups are excluded on the basis of ethnicity, caste, sex or socioeconomic status. The consequences can be that risk management instruments serve the interests of the more influential community elites and/or marginalize the less powerful (Marsh 2003; Mattingly 2002).

Private sector institutions are involved in risk management in numerous ways in the search for business opportunities. Traders often play a key role in ensuring national and local food availability in times of production shortfall, both directly and as providers of credit against harvests, labour, etc. Traders also facilitate the availability of agricultural inputs, sometimes based on credit. Banks and insurance companies sometimes provide credit and savings facilities as well as insurance to compensate for income losses.

Through their control over macroeconomic, structural and sector policies, early warning systems and their possible efforts to complement community and private sector efforts, national governments play a central important role in managing threats to food security through policies and budgetary allocations and by providing the legislative framework for risk management efforts of other actors. These functions are supported by international institutions, UN agencies, bilateral donors, etc. through their provision of resources, technical guidance and global frameworks and facilities to manage risks that are beyond the national-level capacity.

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6 If functioning food markets exist, few vulnerable households, given their size, are likely to influence aggregate food availability, even if production for auto-consumption is an important livelihood strategy.

Market/non-market based instruments

Formal risk management instruments can be market or non-market based. Market-based mechanisms relate mainly to mitigating or coping to ensure stable access to food. Market based mechanisms rely on functioning market institutions and are motivated by profits. However, often, rural poor are not seen as profitable clients by bankers or insurance firms for a range of reasons, including moral hazard problems, information asymmetries, chronic poverty, lack of collateral, high transaction costs and weak contract enforcing environments. This has meant that formal market-based insurance, credit and savings instruments in rural areas of developing countries have largely failed to emerge (Devereux 2001; Heitzmann, Canagarajah and Siegel 2002; Holzmann and Jørgensen 2000), and thus the task of providing such services are often left with governments and/or community-based organizations.

Preventing/mitigating/coping

Risk management instruments can be implemented, before, during or after risks materialize and can be categorized as ex ante (prevention and mitigation) and ex post (coping) instruments. The same risk can often be addressed at different points in time. For instance, floods can be managed ex ante by building embankments to avoid inundation of agricultural land and by providing crop and livestock insurance that is accessible to farmers with low incomes. Alternatively, or in combination with these ex ante instruments, floods can be managed ex post by distributing food aid and inputs for rehabilitating agriculture.

Prevention instruments aim at reducing the probability of a shock or negative event taking place. Mitigation instruments seek to reduce the impact of a negative event by providing compensation for risk-generated losses. Risk preparedness efforts are ex ante measures seeking to ensure effective ex post responses.

Ex post instruments, also referred to as coping mechanisms, are reactive and put to work only once risks materialize. In relation to food security, they aim at relieving immediate food needs. Changes in livelihood strategies, such as migration in search of work elsewhere, do not necessarily imply negative repercussions on future risk management capacities. On the other hand, distress sales of assets, borrowing at high interest rates, reducing consumption or withdrawing children from school are examples of ex post instruments that relieve immediate food needs at the expense of future risk management capacities. Hence, although such strategies may reduce food insecurity, they increase vulnerability, even if the degree of exposure to risks remains constant.

Some empirical studies suggest that ex ante instruments can be more effective than ex post instruments in managing risks. An analysis by Vakis, Kruger and Mason (2004) on the impact of the coffee crisis in Nicaragua on rural households shows that ex ante strategies were more effective in allowing households to insulate themselves from the shock than ex post strategies. Similarly, using data on poverty rates in Zimbabwe, Owens, Hoddinott and Kinsey (2004) suggest that ex ante instruments would have been more effective than ex post instruments in controlling the impact of the 1994-95 drought in terms of poverty levels.

5.2 Instruments for managing threats to the availability, access and utilization of food

In the following, we look at the main instruments for managing threats related to the availability, access and utilization of food.

The choice of instruments is specific to the natural, political, social and economic conditions of a country or region and to the risks faced. It is also specific to the group of vulnerable targeted, given that risks, but also risk management instruments, can have different impacts on different groups. Some risk management instruments reduce vulnerability for some groups, but increase it for other groups. One example of this is a currency devaluation that increases domestic prices of food and tradables, benefiting

Table 4
Instruments for managing risks related to the availability, access and utilization of food

	Availability	Access	Utilization
Track 1: Improving long-term food security			
Prevention	• Stable macro environment • Trade promotion • Develop market and storage infrastructure • Improve input and output markets • Improve natural resource management • Increase productivity and production capacity • Improve sustainable and diversified production • Reduce production variability • Improve agricultural research • Raise investment in agriculture	• Increase productivity of income generating activities • Promote rural development and farm/non-farm linkages • Empower women and other marginalized groups • Promote and protect needs of children • Promote access to education	• Promote preventive health practices • Enforce food safety regulations and institutions • Increase immunization • Water and sanitation infrastructure
Mitigation	• Improve agricultural extension services • Facilitate diversification • Establish buffer stocks	• Livelihoods diversification • Promote insurance and savings	• Provision of health services
Track 2: Addressing immediate food requirements			
Coping	• Market facilitation (transport, information) • Food aid • Facilitate food imports	• Social safety nets, including cash transfers, food subsidies, work fare programmes • Migration • Consumption smoothening • Asset sales • Formal/Informal credit • School feeding	• Disease control • Immunization • Water and sanitation

Source: Adapted from World Bank (2001) and FAO (2003).

farmers producing surpluses of tradable products, but negatively affecting producers of non-tradables, such as subsistence farmers or unskilled landless labourers (FAO 1997).

Following recent work in FAO on how best to reduce hunger in a sustainable manner, this paper uses the twin-track approach to analyse different instruments for risk management. The approach builds on the premise that sustainable reductions in hunger require two sets of interventions: (i) sustainable agricultural and rural development aimed at supporting and enhancing the livelihoods of the poorest and most vulnerable groups and (ii) targeted interventions and programmes to enhance immediate and direct access to food and nutrition by the most needy (FAO 2003).

The first track includes mainly ex ante measures. These include prevention instruments for removing structural risks and for creating the conditions that allow households to mitigate risks. The second track mainly addresses food insecurity through ex post instruments. As post-shock environment also are pre-shock environment in a dynamic chain of events, some track II instruments, aimed at addressing immediate food needs, can also be used for reducing vulnerability in the future. The main mechanism for this is to support households in avoiding meeting current food needs by exhausting capacities to manage future risks.

Table 4 presents an overview of key instruments available for managing risks related to food security. Most of the different measures are well-known and so are not described in detail. As with risks, the instruments have been linked to the food security dimension they foremost address. However, given the links between the different dimensions of food security, some of the instruments affect more than one dimension.

Instruments for managing risks related to food availability

Instruments for stabilising food availability must aim at ensuring the supply of nutritionally adequate food. This stability can be achieved through domestic production, domestic food stocks changes and concessional/non-concessional food imports. Empirical research indicates that among these instruments, improved food productivity and non-concessional imports are more useful in dampening volatility in food availability than concessional imports (Barrett 2001).

Improving food production and its handling comprises measures that concern agricultural sector development (FAO 1997). Instruments for improving national production include investments in irrigation, research into drought/pest resistant varieties and encouraging farm level adoption of new technologies. These also include the provision of effective agricultural extension services addressing longer-term food production issues as well as rehabilitating agricultural activities after shocks affecting production. The ability to diversify or change production will vary between livelihoods and wealth group, pending on risk adversity.

A range of instruments relate to the capacity of the market to respond to supply fluctuations. This includes efforts to improve the longer-term performance of input/output markets through infrastructural development aimed at increasing spatial market integration and the development of information systems to increase market transparency and allow a more efficient spread of supply shocks. Early warning systems, providing weather, crop or price forecasts are ways of bridging information asymmetries between actors. Such systems also provide contingency planners a basis

for estimating the extent of risks and preparing effective responses (Von Braun *et al.* 1992; Buchanan-Smith and Davies 1995; Mattingly 2002).

Commercial imports—by the public or private sector—play a crucial role in stabilising food availability in low and middle income developing countries, but foreign exchange constrains can limit the capacity to use this instrument (Barrett 2001). An alternative is to maintain buffer stocks, either public, private or community based, to assist in spreading out the impact of local, regional or national harvest failures or in seasonally cut off areas.

Instruments for managing risks related to food access

Instruments for managing access to food aim at ensuring that households are able to meet food consumption needs. This requires instruments that stabilize households' purchasing power/consumption ability through asset management and by stabilising income flows and/or stabilising food prices. This is in particular achieved through financial instruments, diversifying income and livelihood activities, increasing the returns to livelihood activities, asset sales and safety net programmes.

Formal and informal insurance, savings and consumption credit are financial instruments used for smoothening consumption. However, informal community-based insurance mechanisms relying on limited pools of participants may default when confronted with a covariate shock. Alternatively, savings involve investing income surpluses in private assets (for example, livestock, food stocks, jewellery, and cash) with the intention of using these to gain access to food in times of need. The extent to which the invested assets maintain, or even increase, their value over time is critical in determining their effectiveness as risk management instruments (Zeller *et al.* 1997)

In the absence of formal credit services, households obtain consumption credit through informal mechanisms such as friends and family. However, among the poor, lending capacities may be limited, especially vis-à-vis meso and macro level shocks, when a large proportion of households are facing disruptions to income flows. Credit restrictions drive interest rates up, and so households can be forced to take out expensive loans undermining their longer-term asset accumulation and increasing their vulnerability.

Income diversification can also be used for mitigating risks. To be effective in increasing stability of income and access to food, a household's set of income sources must have low covariance for each given risk. Unfortunately, a characteristic of developing countries is that most income-generating opportunities available to rural households are highly covariant for specific risks because income-earning opportunities depend on a limited set of mainly agriculturally based activities. Economic development beyond the agricultural sector can thus be used as an instrument for increasing the effectiveness of livelihood diversification (Swift 1989; Ellis 1998, Baulch and Hoddinott 2000), including improving farm/non farm linkages. Changing or diversifying livelihoods is also used for ex post coping, for example through migration, to find additional sources of income, or in more desperate stages forcibly as a consequence of asset sales (Ellis 1998; Devereux 2001).

When households are faced with falling access to food, they may decide to tradeoff short-term consumption needs against longer-term viability by selling their assets,

reducing expenditures on nonfood items or shifting to lower-cost diets. Instruments that have lower long-term costs, such as food rationing, are adopted first, whereas instruments with higher long-term costs and low reversibility, for example selling the family's plough, are adopted later (Corbett 1988). The effectiveness of distress sales of assets will depend on the price behaviour of the asset in question. With highly covariant risks, asset prices tend to rise and fall widely if many households want to buy and/or sell similar goods at the same time (Murdoch 1999; Holzmann and Jørgensen 2000).

Safety net programmes, such as public employment programmes, food subsidies and school feeding, transferring assets to households, be it cash, food or other commodities, can be used to maintain a minimum nutritionally adequate food consumption level and at the same time help to avoid households eroding their asset base. In nonemergency contexts, safety nets can also be used to reduce risk adversity and encourage diversification into more risky activities with higher returns (Drèze 1990; Sinha and Lipton 1999; Devereux 2001).

Until the 1980s, many governments kept large quantities of food reserves that were used to stabilize food prices in the event of hikes in food prices. These were the target of much criticism because of the expenses of storage and effects on producers' incentives. Despite criticism, government food-stock policies still play an important role in many developing countries. Another less well-tested ex post instrument involves using variable import tariffs to dampen the effect of rises in international food prices on domestic prices (Barrett and Sahn 2001).

Instruments for managing risks related to utilization of food

Risk management instruments related to proper food utilization evolve around protecting health status of individuals. The main instruments are concerned with improving nutrition and healthcare practices, health service delivery, ensuring access to safe water and sanitation, but also with protection of food quality and safety.

Promotion of good nutritional practices, including safe food handling and the awareness of balanced diets, together with simple information on how to avoid or treat basic diseases like diarrhoea, all assist in preventing diseases. Such activities are often a part of community-based nutrition programmes or larger health sector programmes and can include campaigns for national immunization and better sanitary habits.

Access to health services is key to mitigating disease-related risks to food security. Unfortunately, resources devoted to healthcare in developing countries are low, despite these countries having often larger health problems (Schieber and Maeda 1999). This can be a particular problem when dealing with highly covariant health risks, stretching resources to or beyond the limit when treatments are costly, as has been the case with HIV/AIDS. Furthermore, poorer people have less access to health service than richer people. In a review of eight developing country studies of inequality in the health sector, Makinen *et al.* (2000) conclude that access to health care services was unequally distributed to the advantage of richer, partly caused by their higher health expenditure, but also because of better access to publicly subsidized health care services.

Finally, controlling risks related to food safety for consumers requires both national and international regulation to guide national food production as well as ensure standards for internationally traded food. Moreover, it requires food control systems and programmes

at national and local levels monitoring processes from primary production to final consumption. Whilst export industries in developing countries are pressed to implement food standards in compliance with their target markets, incentives for tight control of food standards in the local markets are often weaker.

6 Conclusion

Improving food security requires an understanding not just of who is food insecure today and why they are so, but also of who is likely to be food insecure in the future and why so. Basing interventions on ex post measures of food security will likely miss important parts of the food security picture, both in terms of who the future food insecure are (targeting), why they are so (causes) and what can be done about it (policy options).

Analysing vulnerability offers a dynamic, forward-looking way of understanding food security dynamics, calling for explicit attention to risks and the options for managing these so as to improve future food security.

Managing risks goes beyond assisting those affected by a particular shock in addressing their immediate food needs. A range of options are available for addressing longer-term food security through sustainable agricultural and rural development, aiming at preventing or mitigating risk.

Risk factors will continue to threaten food security and cause vulnerability. Increasing incidences of HIV/AIDS, continuing civil conflicts and political instability, increasing severe weather events and adverse consequences of globalization are some of the risks likely to cause vulnerability in the coming years (Devereux 2001). Clearly, dealing with such risks through an effective mix of ex post and ex ante interventions will be essential in moving towards achieving the global food security targets.

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