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Regional Cooperation for Food Security:
The Case of Emergency Rice Reserves in
the ASEAN Plus Three

Roehlano M. Briones

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Abstract

After the food price crisis in 2008, the Association of Southeast Asian Nations (ASEAN) endorsed the establishment of a long-term mechanism for the ASEAN Plus Three Emergency Rice Reserve (APTERR). There is sound theoretical basis to justify emergency food reserves as a regional public good, particularly for rice, a major staple throughout Asia. However, in practice, international food reserves have not lived up to their promise. APTERR could be one of several policy instruments to manage food security risks within the context of effective regional cooperation. To play this role, it must address various sets of issues: (i) technical issues regarding the volumes and timing of storage and release of emergency stocks; (ii) financial sustainability; and (iii) institutional issues, such as appropriate organization structure and linkages with other agencies and organizations, whether public or private, and at the national and international levels.

Abbreviations

ADB	Asian Development Bank
AERR	ASEAN Emergency Rice Reserve
AFET	Agricultural Futures Exchange of Thailand
AFSIS	ASEAN Food Security Information System
AIFS	ASEAN Integrated Food Security
AMAF+3	ASEAN Plus Three Ministers of Agriculture and Forestry
APTERR	ASEAN Plus Three Emergency Rice Reserve
ASEAN	Association of Southeast Asian Nations
ASEAN+3	ASEAN Plus Three
EAERR	East Asia Emergency Rice Reserve
IFPRI	International Food Policy Research Institute
FAO	Food and Agriculture Organization of the United Nations
MOAC	Ministry of Agriculture and Cooperatives (Thailand)
MT-EAERR	Management Team of EAERR
NFA	National Food Authority (Philippines)
PRC	People's Republic of China
SAARC	South Asian Association for Regional Cooperation
SPA-FS	Strategic Plan of Action - Food Security
UN	United Nations
WFP	World Food Programme
WTO	World Trade Organization

Executive Summary

Background

In 2008, an extraordinary price surge coursed through the world rice market, raising alarms over a world “food crisis.” Subsequently, the Association of Southeast Asian Nations (ASEAN) approved the ASEAN Integrated Food Security (AIFS) Framework. One of the components of the AIFS Framework is to support the establishment of a long-term mechanism for the ASEAN Plus Three (ASEAN+3)¹ Emergency Rice Reserve (APTERR). The AIFS Framework builds on an existing pilot project among the ASEAN+3, namely, the East Asia Emergency Rice Reserve (EAERR). This report discusses the opportunities and challenges facing the establishment of a permanent emergency rice reserve scheme in the ASEAN region under the mandate of the AIFS Framework.

Emergency reserves as a public good

Food security is defined under the AIFS Framework as a condition in which “all people, at all times, have physical and economic access to sufficient, safe, and nutritious food that meets their dietary needs and food preferences for an active and healthy life.” Hence, the dimensions of food security are *availability*, *accessibility*, *utilization* (i.e., converting access to food into nutritional well-being), and *stability*.

During normal periods, markets may work reasonably well to ensure adequate supply and distribution of food, addressing at least the availability issue. However, market failure becomes apparent in times of food emergencies. First, in emergency situations caused by widespread calamity, commercial food distribution networks may be seriously disrupted and lack the incentive and coordination to rapidly restore supply lines. Due to transaction costs, private traders may move too slowly to release stocks or bring in stocks from other areas or from abroad; worse, they may also be prone to speculative hoarding in anticipation of a higher price. Assuming good governance, a centrally coordinated response by a government free of commercial motives can address faster and more decisively the day-to-day needs of the affected population. Second, establishing and operating an emergency response service as a commercial venture would likely be rendered infeasible by large transaction costs (hence, such privately-run services are rarely observed in practice). For instance, identifying prepaid customers in the event of a large-scale disaster may involve too many costs or delay in service delivery. Third, widespread hunger can lead to social unrest, undermining key market institutions such as private property rights. Private decisions may fail to consider the institutional risks posed by price spikes and supply disruptions.

Extreme price increases may cause the nutrient intake of the poorest households to fall below a critical threshold. Poor households may not have access to coping mechanisms (e.g., sale of assets, inter-household transfers, ability to relocate); hence, the poor may require special assistance. Moreover, market bubbles and volatility can lead to extreme price episodes that may require special protection measures for the most vulnerable households. To the extent that food reserves expedite response to food emergencies, society will enjoy the intended benefit of standby reserves. In this sense, emergency food reserves are a public good.

¹ The ASEAN+3 consists of the 10 ASEAN member states—Brunei Darussalam, Cambodia, Indonesia, Lao People’s Democratic Republic, Malaysia, Myanmar, Philippines, Singapore, Thailand, and Viet Nam—plus the People’s Republic of China (PRC), the Republic of Korea, and Japan.

At the national level, the policy of maintaining emergency food stocks has been widely practiced. However, emergencies that are sufficiently large scale and catastrophic can overwhelm national food stores. International cooperation to address such emergencies becomes viable if (1) the emergency is limited to a few countries; and (2) the emergency affects all or most countries but concerted action averts the crisis with measures such as releasing food stocks during world market price bubbles. Such cooperation can be supported by a precommitment device in the form of an international reserve. This scheme offers mutual assurance to participating countries as well as a valuable supplement to national emergency stocks.

Aims and scope of an emergency food reserve

Implementing an emergency reserve system requires an operational definition of a food emergency. Under the AIFS Framework, an emergency is defined as “the state or condition having suffered extreme and unexpected natural or man-induced calamity, which is unable to cope with such state or condition through its national reserve and is unable to procure the needed supply through normal trade.” Under the traditional notion of food security, a food emergency is associated with natural calamity or large-scale conflict, with humanitarian food aid as a typical response. However, the 2008 price crisis began a serious reexamination of the concept of food emergency to include large and sudden price increases, owing to abnormal market movements.

Estimating the appropriate level of emergency reserves is a complicated issue of balancing food security benefits against the high costs of food storage. Moreover, alternative storage and release modalities would need to be incorporated into the calculation. For instance, private sector storage may be a lower-cost option than state agency storage, particularly under a business climate favorable to the private sector development of grain supply chains. Emergency reserves may be supplemented with other risk instruments, such as maintaining an emergency fund as well as financial instruments linked to emergencies (e.g., commodity futures and derivatives).

International experience

The current drive for food security cooperation in the aftermath of global market turmoil recalls developments in the 1970s. In 1975, the United Nations (UN) General Assembly approved the establishment of the International Emergency Food Reserve under the World Food Programme, with initial stocks of 500,000 tons to be created by voluntary contributions, and a final target of 30 million tons of rice and wheat reserves.

On a regional level, in 1979, ASEAN member states signed the Agreement on the ASEAN Food Security Reserve (AFSR). The agreement established the ASEAN Emergency Rice Reserve (AERR) consisting of national food security stocks voluntarily designated or *earmarked* to address food emergencies. “Emergency” was defined in the agreement in the same terms as does the AIFS Framework. Initial earmarks totaled 50,000 tons. Releases from the AERR were to be channeled through bilateral negotiation between a country in a state of emergency and a country offering its earmarked reserve.

Each of these cooperation arrangements, however, turned out to be ineffective. In particular, the AERR never made a release from its stocks. According to a commissioned review, the AERR was unresponsive to emergency needs because (i) the reserves were too small, (ii) the bilateral negotiation procedure for the AERR merely duplicated regular market or government-to-government transactions, and (iii) the AFSR Board was not able to operate AERR as a regional entity due to the lack of funds for the secretariat.

Nevertheless, the review found that there was a great need to provide mechanisms for short-term relief for food-related emergencies. ASEAN+3 countries pursued the scheme, eventually establishing the EAERR as a pilot project that was implemented from 2003 to 2010. The EAERR was supported by funding from Japan as well as in-kind contributions from the ASEAN member states, mostly from Thailand.

Oversight of the EAERR was vested in a Project Steering Committee that reports to the ASEAN Ministers of Agriculture and Forestry plus the Ministers of Agriculture of the People's Republic of China, Japan, and the Republic of Korea (AMAF+3). Day-to-day management is vested in a Management Team (MT–EAERR), whose office is hosted by the Ministry of Agriculture and Cooperatives (MOAC) of Thailand. There are two types of reserves under the EAERR: earmarked reserves, which are defined as being under the AERR; and stockpiled reserves, which are rice stocks or in-kind contributions donated to the rice reserve. Stockpiled reserves are provided as free food aid under the Tier 3 program of the EAERR, which is intended to meet the acute emergency needs of disaster victims, on grant terms. The receiving country is expected to defray the logistics and distribution costs. Japan largely finances the stockpiled reserves, with significant in-kind contributions from Thailand. Tier 3 releases, totaling nearly 3,000 tons, have assisted victims of disaster and hunger in Cambodia, Indonesia, the Lao People's Democratic Republic (Lao PDR), Myanmar, and the Philippines.

Earmarked stocks account for the bulk of the rice reserve. The size of the earmark increased tremendously, from the original 50,000 tons under the AERR to 787,000 tons under the EAERR, largely from the sizable contributions of the Plus Three countries. Withdrawal from earmarked stocks can take the form of an emergency loan or grant (under the Tier 2 program) or as a special commercial contract (under the Tier 1 program) to address a supply–demand deficit in rice. Both types of release are to be facilitated by MT–EAERR to ensure that the terms and conditions are mutually agreeable to the transacting parties. Thus far, there has been one transaction under Tier 1 involving the release of 10,000 tons from Viet Nam that was received by the Philippines in March 2010. There has been no release under Tier 2.

The establishment of a permanent scheme under APTERR is now under way. An Agreement on APTERR, formalized in October 2011, commits countries to principles of regional cooperation in response to food emergencies. “Emergency” is defined in the same way as in the AIFS Framework. However, the agreement relegates program strategies and operational details for internal discussion to the APTERR Council and Secretariat. There remain unresolved technical, financial, and institutional issues in shifting from a pilot project to a large-scale and permanent emergency reserve scheme.

Issues facing APTERR

First are the technical issues relating to the release and storage of stocks. The stockpiled reserves of APTERR are aimed at providing humanitarian food relief for localized emergencies; this more closely corresponds to the emergency reserves being recommended to counter food crises (FAO et al. 2011). The amount of stockpiled reserves will likely remain modest due to their high cost. Nevertheless, APTERR would clearly benefit from a strategy of raising a suitable level of stockpiled reserve as well as identifying the appropriate storage form and locations, to provide immediate assistance for disaster victims in the throes of a food emergency.

APTERR should also move more aggressively in the releases from earmarked reserves, as these represent the scheme's biggest resource to overcome food emergencies. Earmarked reserves may be targeted to address market-wide disruption, such as a sudden food availability gap at the national level or an extreme price spike.

Procedures need to be streamlined to make emergency response more frequent. It is anticipated that Tier 1 will offer a sustained basis for tangible food security cooperation; however, greater clarity is needed on mechanisms for arriving at the prices, terms, and conditions of special commercial transactions. The mechanism should be sensitive and responsive enough to detect and act quickly in cases of food emergencies where domestic response or importation may be insufficient or too slow.

However, release triggers that are too sensitive may lead to large-scale withdrawals from earmarked reserves in excess of actual requirements. This raises concerns about potential distortions to normal international trade. "Emergency" needs to be more accurately defined in relation to "normal trade" as a condition for release of APTERR stocks to prevent trade distortions and assure World Trade Organization (WTO) compliance. Clearly, trigger and release procedures under APTERR must be guided by a food emergency monitoring and information system. The existing ASEAN Food Security Information System (AFSIS), hosted by the Office of Agricultural Economics (OAE) of the MOAC of Thailand, together with the ASEAN Food Security Reserve Board under the Ministry of Commerce of Thailand, may be existing mechanisms to support APTERR's information and monitoring requirements. APTERR should take more concrete steps to formalize information exchange and build its analytical capability toward a more proactive and systematic implementation of emergency food response.

The second set of issues is financial. This entails mobilizing strong funding support from all the ASEAN+3 member countries, based on ability to pay and other criteria. A credible benefit–cost analysis may be useful to mobilize this support. Furthermore, there may be mechanisms to recover costs or to make benefits conditional on payments. This frames a business model for APTERR that would be helpful in ensuring its financial sustainability.

The third set of issues is institutional. Both the regional reserve and national stock agencies should achieve some level of organizational capacity for effective response to food security crises. Moreover, laws, policies, and regulations should be harmonized across member countries to facilitate food security cooperation and the quick and orderly transfer of rice stocks. Relationships with other schemes and organizations would need to be reexamined, such as with domestic emergency reserve, international aid agencies, or even a proposed international food emergency reserve.

Another external linkage to be explored is the relationship with the private sector. The Tier 1 program may interest commercial players; storage and logistical requirements of the reserve may also be opened to the private sector. Last, APTERR will need to position itself in relation to other market-based instruments for addressing food insecurity. These include index-based risk transfer products as well as forward and futures contracts (and their variants such as commodity options). Currently, however, the futures market in Southeast Asia remains in its infancy; nevertheless, a permanent scheme on emergency rice reserve should remain dynamic and adaptive to a changing set of market conditions and financial institutions.

ASEAN+3 member states have generally implemented aggressive domestic policies to combat food security threats. However, a regional and multilateral approach to food security requires renewed commitment among all the member states. Currently, APTERR is strong on the principles of cooperation, but short on specifics. While the experience of the EAERR would be invaluable in applying lessons learned, APTERR will have to operate significantly beyond the level of a pilot scheme. This review points out the directions for further analysis, research, and evaluation toward a functional and sustainable emergency reserve for the member countries of the ASEAN+3.

1. Introduction

1.1 Background of the Study

The food price crisis of 2007–2008 thrusts food security at the forefront of the development agenda. The 2008 price surge in the rice market was particularly alarming for Asian countries that consume rice as their main staple. After a brief respite, food prices soared once again in 2010. Fortunately, the price increase for rice has lagged behind that of other commodities, although there remains legitimate concern about recurring food price hikes and volatility.

The short-term response of numerous exporting countries was to raise export taxes or impose export restrictions. Governments of some importing countries reduced import taxes and attempted to procure basic foodstuffs from the international market. Food safety net programs were expanded (Demeke, Pangrazio, and Maetz 2009). In the medium term, several countries (such as Malaysia and the Philippines) increased their rice self-sufficiency targets.

Aside from unilateral responses, governments have also pursued multilateral initiatives. The L'Aquila Joint Statement in 2009 by the Group of Eight and some developing countries (including the People's Republic of China (PRC), India, and Indonesia) affirmed the importance of maintaining open trade and increasing agricultural investments for food security. Subsequently, the World Summit on Food Security of 2009 expressed its commitment to food security that would be supported by agricultural and other investments, coordinated action by member governments and the donor community, and multilateral response to food security threats.

At the regional level, the Association of Southeast Asian Nations (ASEAN) Summit of March 2009 recognized both “the recent sharp increase in international food prices and global financial crisis, which has brought adverse impacts on food security and serious concern on possible socioeconomic impacts of ASEAN Member States.” The Summit approved the ASEAN Integrated Food Security (AIFS) Framework, supported by a Strategic Plan of Action on Food Security (SPA-FS) that contains a more concrete set of activities than other food security declarations. The major components of the AIFS Framework are:

1. Food security arrangements and emergency short-term relief
2. Sustainable food trade development
3. Integrated food security information system
4. Agricultural innovation

The AIFS Framework and the SPA-FS seeks to strengthen and expand existing regional initiatives along these components. With respect to component 1, a major activity is supporting the establishment of a long-term mechanism for the ASEAN Plus Three (ASEAN+3) Emergency Rice Reserve (APTERR). This reserve builds on the East Asia Emergency Rice Reserve (EAERR), the pilot project of the ASEAN Ministers of Agriculture and Forestry and the Ministers of Agriculture of the PRC, Japan, and the Republic of Korea (AMAF+3). The EAERR in turn is a revitalization and expansion of the ASEAN Emergency Rice Reserve (AERR) that was established in 1979.

This report focuses on the role of regional emergency reserves in promoting regional food security and outlines the challenges in converting initial pilot arrangements into a permanent scheme. The paper particularly focuses on rice, given its preeminent status as a grain staple

throughout the region. The rest of the report is organized as follows: section 2 presents a conceptual framework on food security and the need for emergency food reserves; section 3 reviews the experience of the ASEAN countries in cooperation on food reserves; and section 4 discusses the challenges and opportunities in relation to APTERR and outlines the way forward for the emergency reserve scheme.

1.2. The Asian Context

The developing countries in the ASEAN region have made tremendous strides to reduce both the prevalence and absolute number of the undernourished (Table 1). During the Millennium Development Goal (MDG) period of 1990–2006, the number of the hungry fell by 20 million in Southeast Asia and 50 million in the PRC. The proportion of the hungry (based on dietary energy intake) declined by 9 percentage points in Southeast Asia and 5 percentage points in the PRC.

However, in relation to the MDG and World Food Summit targets, progress has been too slow, due largely to the food price and global financial crises (FAO 2009). Some alarms have in fact been raised over the increase in absolute numbers of the hungry in Indonesia (by 1.2 million), and the sluggish decline in absolute numbers for Cambodia, Lao PDR, and the Philippines.

Table 1: Undernourishment Indicators for Selected Asian Countries, 1990–1992 and 2004–2006

Country	Proportion of undernourished (%)		Population undernourished (million)		Total population (million)
	1990–1992	2004–2006	1990–1992	2004–2006	2004–2006
Southeast Asia	24	15	105.7	84.7	551.9
Cambodia	38	25	3.8	3.5	14.0
Indonesia	19	16	34.5	36.7	226.1
Lao PDR	27	19	1.1	1.0	5.7
Myanmar	44	17	18.1	8.3	48.0
Philippines	21	15	13.3	12.7	84.6
Thailand	29	17	15.7	10.7	63.0
Viet Nam	28	13	18.7	11.2	85.0
PRC	15	10	177.8	127.4	1,320.5

Lao PDR = Lao People's Democratic Republic, PRC = People's Republic of China.
Source: FAO (2009).

The International Food Policy Research Institute (IFPRI) has developed a general measure of hunger called the global hunger index (GHI) (von Grebmer et al. 2009).² The index is a composite of the undernourishment prevalence, prevalence of underweight children aged under 5, and mortality rate of children under 5. The index is scaled 0 to 100, and rises with worsening hunger. Hunger categories, and corresponding cut-offs, are as follows: *Low* (below 5), *Moderate* (below 10), *Serious* (below 20), *Alarming* (below 30), and *Extremely Alarming* (above 30). Table 2 presents figures for some countries in Southeast Asia and for the PRC. In general, the hunger situation in these countries improved significantly, both in terms of the hunger index and the

² FAO has an Aggregate Household Food Security Index, which is based on the proportion of the population undernourished, the average food gap, and inequality as well as dispersion in the distribution of the food gap (Thomson and Metz 1998). However, the index has fallen into disuse possibly due to intensive data requirements. FAO's latest report on global food insecurity (FAO 2010) reports the global hunger index.

hunger category. However, the hunger problem continues to be rated *Serious* in these countries based on the hunger index.

Table 2: Global Hunger Index (GHI) for Selected Asian Countries, 1990 and 2010

	1990		2010	
	GHI	Category	GHI	Category
PRC	11.6	Serious	6.0	Moderate
Thailand	16.4	Serious	8.5	Moderate
Viet Nam	24.8	Alarming	11.5	Serious
Philippines	19.0	Serious	13.0	Serious
Indonesia	19.7	Serious	13.2	Serious
Lao PDR	29.2	Alarming	18.9	Serious
Myanmar	29.8	Alarming	18.8	Serious
Cambodia	31.7	Extremely alarming	20.9	Alarming

Lao PDR = Lao People's Democratic Republic, PRC = People's Republic of China.
Source: von Grebmer et al. (2010).

2. Food Security and Food Reserves: Conceptual Framework

2.1 Food Security

2.1.1 Dimensions of Food Security

Food security is defined under the AIFS Framework (which, in turn, is based on the definition of the World Summit on Food Security of 1996) as a condition in which “all people, at all times, have physical and economic access to sufficient, safe, and nutritious food that meets their dietary needs and food preferences for an active and healthy life.” Hence, the key dimensions of food security are *availability*, *accessibility*, *utilization* (which converts access to food into nutritional well-being), and *stability*.

Traditionally, food security has been associated with the aggregative concept of food availability. Availability pertains to “sufficient quantities of food of appropriate quality, supplied through domestic production and/or imports (including food aid).” Sufficiency is estimated using some benchmark level of average per capita consumption. However, Sen (1981) initiated a shift in focus toward household- and individual-specific access to food, based on “entitlements.” In the AIFS Framework, this pertains to “the set of all commodity bundles over which a person can establish command given the legal, political, economic, and social arrangements of the community in which they live.”

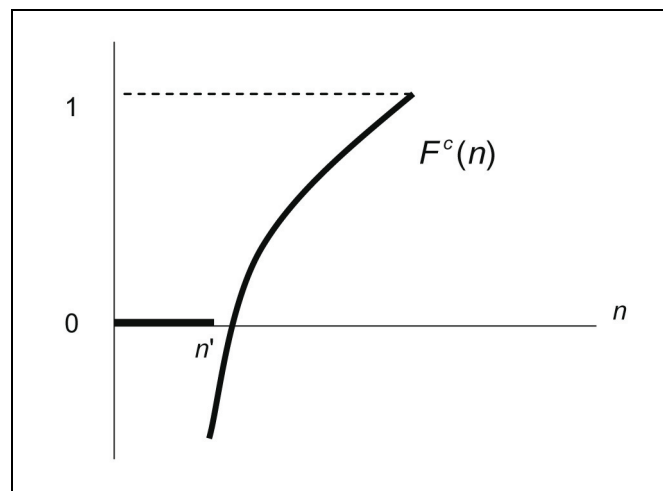
Stability can be viewed in terms of the distinction made by Roumasset (1982) between *long-term* and *short-term* food security. The former refers to a permanent or persistent state of food security; for instance, high-income households may be able to ensure their continued access to food in the face of the most severe shocks. The latter refers to the period-to-period level of safety of households in ensuring at least a minimum level of food consumption (Briones et al. 1999). Hence, a poor household may momentarily enjoy adequate dietary intake, but remain food insecure in the short term as it remains vulnerable to entitlement shocks.

2.1.2 Microeconomic Approach to Food Security

Barret (2002) outlines key elements for a microeconomic understanding of food security. These include *risk* and *uncertainty* (food security being an inherently ex ante concept); *irreversibility* (nutrient intake below a threshold over a prolonged period leads to permanent physical impairment, or even death); and *behavioral dynamics*. That is, individuals act to maximize intertemporal utility that is produced from both physical states and consumption of various goods. There are trade-offs between utility from food intake and utility from other goods such as shelter, education, and so forth; however, nutrients are distinguished by the necessity of high frequency intake. This puts a premium on sustained access to factor markets that facilitate trade over space and time, and on safety nets in the case of incomplete markets.

To illustrate these ideas, we reproduce Barret's graph (Figure 1) that relates nutrient intake (plotted on the horizontal axis) to probability F^c (plotted on the vertical axis); the latter is the likelihood that the next physical state exceeds a threshold c , representing survival. The curve is kinked at n' , which represents some nutrient intake threshold, below which death is certain in the next period. Where the individual is on the curve depends on individual preferences and constraints. The individual may end up "choosing" a particular nutrient intake and point on the F^c curve, given his or her current entitlements. A food "emergency" may denote a point on the curve, corresponding to a level of F^c that is sufficiently low to warrant concern from society about prospects for survival and health.

Figure 1: The Relationship between Food Security and Nutrient Intake



Source: Barret (2002).

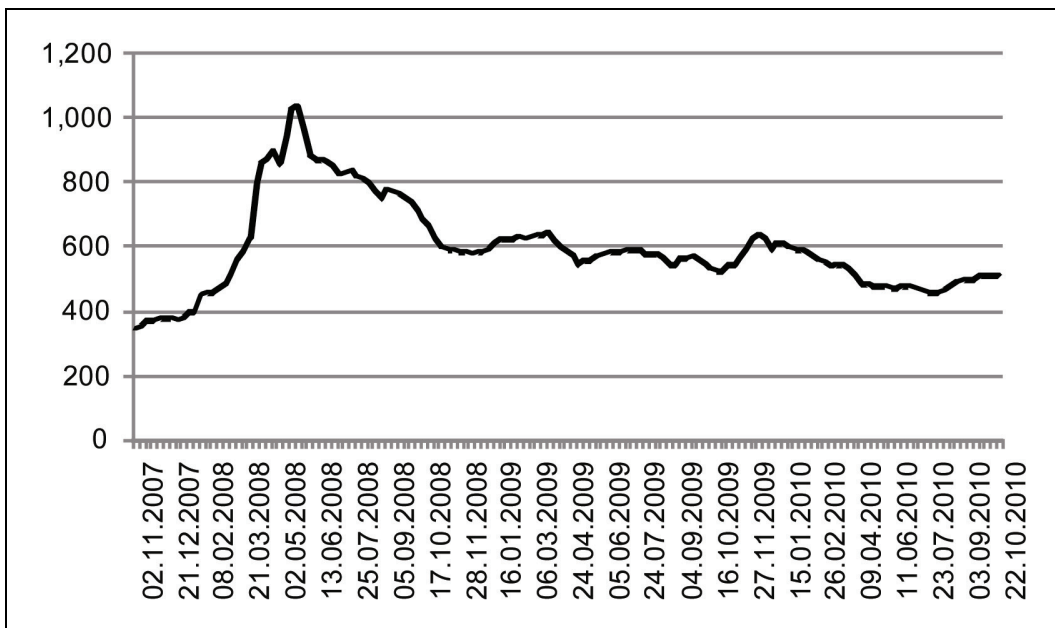
The framework can be extended to food security dynamics. First, because of inadequate food entitlements, some individuals may persistently fall below some probability threshold of being food secure, keeping them in a state of chronic food insecurity. Second, some households may face episodic food insecurity due to sporadic shocks or seasonal variations (e.g., for agricultural households). Lastly, low consumption in the current period, or a downward shift in the curve due to ill health, may reduce the likelihood of wellness in the next period, leading to a downward spiral of malnutrition and diminishing health.

2.1.3 What Is a Food “Emergency”?

Operational definitions of a food “emergency” vary. In the AIFS Framework, an emergency is defined as “the state or condition having suffered extreme and unexpected natural or man-induced calamity, which is unable to cope with such state or condition through its national reserve and is unable to procure the needed supply through normal trade.” Under the traditional notion of food security, an emergency is associated with natural calamity or armed conflict, with humanitarian food aid as a typical response.

The World Food Programme (WFP 2005) applies a broader definition of emergencies 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.” Consistent with this broader meaning, there is now a serious reexamination of the concept of food emergency to include large and sudden price increases due to abnormal market movements, such as during the 2008 price crisis (Figure 2). The figure shows that the price of rice peaked in May 2008 at over \$1,000/ton, triple its level a few months earlier, before finally retreating at levels still far higher than in 2007.

Figure 2: Weekly Price of Thai Rice (White B 2nd grade) in \$/ton, 2007–2010



Source: FAO Commodities and Trade Division (2011).

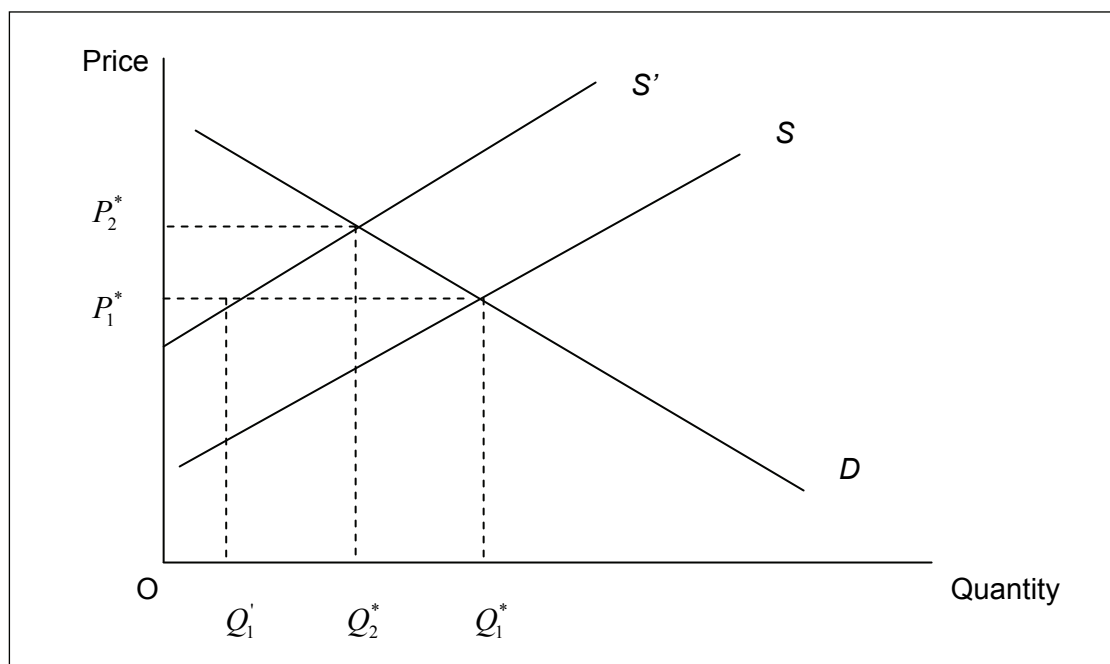
In 2008–2009, the Food and Agriculture Organization of the United Nations (FAO 2009) estimated an increase in the ranks of the hungry worldwide, from 915 million to 1.02 billion, as a result of the combined impact of the food price hike and the global financial crisis. Dawe (2001, 166) argues that “[r]ice price stabilization can thus serve as a key component of a social safety net program by preventing sharp price fluctuations, instead of merely reacting to price increases when they occur with the hasty implementation of food distribution programs.” The relationship between food security and markets is a complex one that deserves detailed discussion.

2.2 Food Security and the Market

2.2.1 The Basics: Supply and Demand

Markets are ubiquitous institutions for the production and distribution of food. Most households, especially the poor, are net buyers of food, even in agriculture-dependent rural areas (FAO 2009). The basic market model offers an instructive approach to understanding threats to food security (Figure 3). Denote the observed price and quantity for a food commodity by P_1^* and Q_1^* that correspond to some “normal” level of price and quantity where per capita consumption is deemed more or less adequate. Economic theory associates this normal level with an equilibrium state, where the supply curve S intersects the demand curve D . Now assume a supply shock, say a drought, that shifts S leftward to S' . In the immediate aftermath of the shock, price may remain P_1^* but quantity falls to Q_1' ; the market is in shortage as quantity demanded exceeds quantity supplied. On an aggregate scale, this may correspond to a lack of availability; in social terms, consumers may end up queuing for scarce food supplies, or alternatively these supplies may be rationed to consumers.

Figure 3: Basic Supply and Demand Diagram with an Adverse Supply Shock



Source: Author's diagram.

Based on the supply–demand model, this state is merely a transitory disequilibrium; producers prefer a higher price (to increase profit), while consumers would be willing to trade off a higher price in exchange for greater availability of supply. The price rises until a new equilibrium is reached, at Q_2^* . By itself, the market addresses the shortage—rationing disappears, in response to a price signal. Furthermore, if the shock is temporary and supply resumes its original position, then the price also moves back—this permits a distinction between short-term trends and market “fundamentals.”

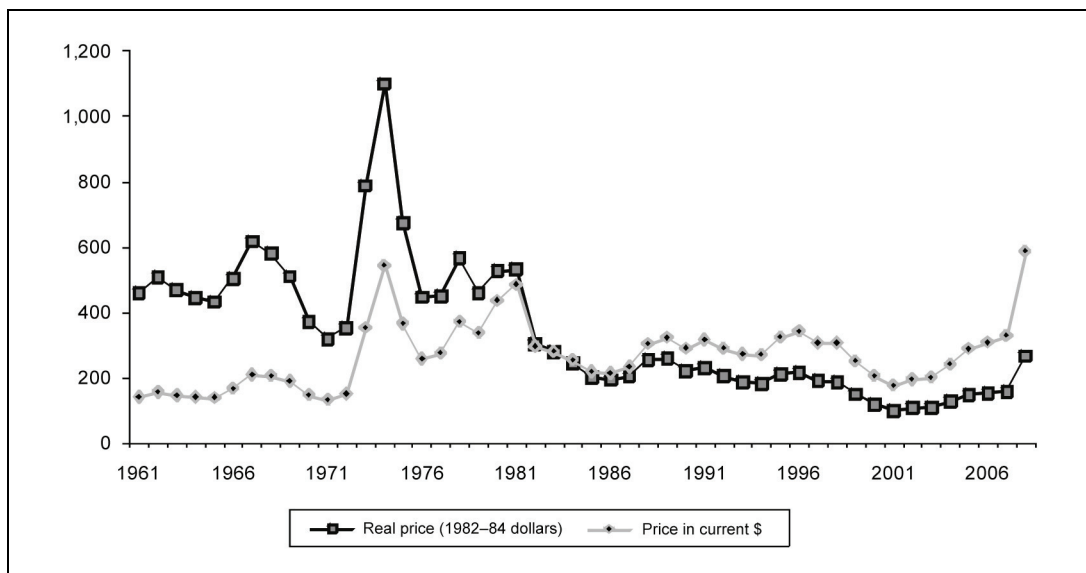
2.2.2 Price Stability and Arbitrage

Price is an essential element of market adjustment to shocks. Nevertheless, markets have evolved mechanisms for price stabilization. Extensions to the basic model can incorporate traders who exploit profit opportunities from *spatial* and *temporal arbitrage*. Spatial arbitrage refers to the delivery of output from low-price locations to high-price locations (provided price differences exceed transport costs). Note that international trade is basically spatial arbitrage over the widest possible scale. Intertemporal arbitrage, on the other hand, refers to storage—the accumulation of stocks during low price episodes, for later sale during high price episodes.

Price instability is a prominent feature of food markets. The supply of agricultural commodities is highly sensitive to variations due to pests, weather, and other environmental vagaries. These variations are exacerbated by uncertainties associated with climate change and the emerging link between food and fuel markets with the rise of biofuels. Furthermore, both demand and supply are characterized by low price elasticities, leading to sharp price changes whenever quantity adjustments are needed.

Figure 4 shows world rice prices since the 1960s. While the food crisis in late 2010 represents a relative uptrend, this is however dwarfed by the dramatic price spikes in 1972–1974 that raised global alarm on hunger and food insecurity. Subsequently, prices collapsed and at low levels up to the 1990s. Finding a pattern in market gyrations is difficult. Cashin, McDermott, and Scott (2002) identify several stylized facts in commodity price series—prices tend to stagnate, except for occasional episodes of sharp upward spikes; prices follow cyclical though unpredictable patterns (e.g., the severity of booms and booms which are unrelated to their duration); and price shocks exhibit persistence.

Figure 4: Annual Rice Prices in 1984 \$, Thai 5% Broken, 1961–2009



Market price data are from the International Rice Research Institute's World Rice Statistics (2009); deflator is based on the dollar consumer price index (CPI) from the United States Bureau of Labor Statistics (2009).
Source: Author.

When the persistence of shock approaches permanence, the price series is described as *non-stationary*. A non-stationary time series is problematic, as there is no guarantee that the series would return to the fundamentals, which undermines the signaling function of price.

Stigler (2011) shows how the *competitive storage model* combines supply shocks with storage to obtain price persistence; however, the model is consistent with either stationarity or non-stationarity. Alternatively, price dynamics can be modeled using cobweb models under adaptive expectations, as well as linear demand and supply (as in Figure 3). Recently, cobweb models have experienced a renaissance, by incorporating non-linear demand and supply, despite eschewing sophisticated expectations formation (such as the fashionable rational expectations approach). Nonlinearities may lead to chaotic dynamics (e.g., Hommes 1994) that may be more consistent with irregular cycles in actual commodity markets.

He and Westerhoff (2005) examine the case of speculative price bubbles that can endogenously arise from speculative traders switching among alternative rules. The “technical” rule makes bull (bear) market projections when price is high (low) relative to fundamentals. The “fundamentalist” rule projects an adjustment back to equilibrium whenever prices veer off fundamentals. The resulting price dynamics imply high volatility as well as the regular emergence of speculative bubbles and market crashes.

2.2.3 Emergency Reserves as a Public Good

Food is a rival and excludable good. Hence, economic theory suggests that, under competitive conditions, markets are a reasonably reliable mechanism for producing and distributing food. Even the provision of emergency food relief can, in principle, be operated on a commercial basis: some households may be willing to pay in advance for a storage service that makes food available in the event of an emergency, i.e., a form of food emergency insurance. However, several problems confront a hypothetical market for such a service:

- In many emergency situations caused by widespread calamity, commercial food distribution networks may be seriously disrupted, and lack the incentive and coordination to rapidly restore supply lines. Due to transaction costs and poor market infrastructure, private traders may move too slowly to release stocks or bring in stocks from other areas or from abroad; they may also be prone to speculative hoarding in anticipation of a higher price. Assuming good governance, a centrally coordinated response by a government free of commercial motives can address faster and more decisively the day-to-day needs of the affected population.
- Widespread hunger may lead to social unrest, undermining key market institutions such as private property rights. The food crisis of 2007–2008 has been associated with various food riots and political turmoil in several countries, e.g., Bangladesh, Burkina Faso, Cameroon, Egypt, Haiti, and Indonesia (Kwa 2008). Private decisions may fail to consider the political and institutional risks posed by price spikes and supply disruptions.

Extreme increases in prices may cause the nutrient intake of the poorest households to fall below critical thresholds, which is noted in the previous section. Access to adequate coping mechanisms between poor and non-poor households (i.e., ownership of assets, inter-household transfers, ability to relocate, and so forth) is grossly unequal; hence, the poor may require special assistance. Moreover, market bubbles and volatility can lead to extreme price spikes that are unrelated to market fundamentals. Society may also deem it necessary to shield the poorest and most vulnerable members from these extreme price episodes. To the extent that food reserves can expedite response to food emergencies, the benefits of which are non-rival

and non-excludable, then society will enjoy the intended benefit of standby reserves. In this sense, emergency food reserves are a public good.

At the national level, the policy of maintaining emergency food stocks has been widely practiced. However, emergencies that are sufficiently large scale and catastrophic can overwhelm national food stores. International cooperation to address such emergencies becomes viable if (i) the emergency is limited to a few countries; (ii) the emergency affects all or most countries but concerted action averts a crisis; and (iii) logistical and institutional infrastructure is adequate for ensuring swift response and delivery of rice stocks across countries. Such cooperation can be supported by a precommitment device in the form of an international reserve. This scheme offers mutual assurance to participating countries as well as an invaluable supplement to national emergency stocks.

2.2.4 Emergency Reserves versus Buffer Stocks

An emergency food reserve should be carefully distinguished from buffer stocks that are generally aimed at stabilizing prices. Typically, buffer stocks target a price band, where the upper and lower limits denote trigger prices. When the market price rises above (falls below) the price band, buffer stocks are released (accumulated), in an effort to bring the market price back within the band. In contrast, emergency reserves are more limited in scope: (i) their utilization may be limited to food assistance, without explicit price targeting; (ii) the upper price trigger for making a release is set very high, at prices that already threaten food security for a large proportion of the poor; and (iii) there may be no lower price trigger for acquiring stocks, except that the reserves should be accumulated during normal market conditions.

Since the 1980s, sanguine assessments about the need for price stabilization through public agencies have given way to skepticism, due to past overestimation of benefits and underestimation of costs (Newberry and Stiglitz 1981). The most obvious cost of public stocks is the direct cost of operations (logistics and marketing). Seldom has a public agency in the real world profited from buffer stocking (Berck and Bigman 1993). One estimate puts minimum stocking cost at 17% of purchase price (Vanzetti 1998).

Even if effective in stabilizing prices, public stocks may inflict indirect cost by discouraging private storage (Islam and Thomas 1996). On the other hand, public traders have often targeted a domestic price band that is too high compared to the underlying equilibrium price, leading to distortions and worsening public deficits, and policy ineffectiveness in the long run. Often such a high price band becomes subject to speculative attack, causing its rapid collapse (Salant 1983).

A set of country studies covering major rice exporters and importers in South and Southeast Asia (Bangladesh, India, Indonesia, Pakistan, Philippines, and Viet Nam) examined the role of parastatals in grain marketing (Rashid, Gulati, and Cummings 2008). Past policies on the grains market were motivated by conditions prevailing during the early Green Revolution period when domestic markets were poorly integrated and international markets were highly volatile, and when countries faced severe foreign exchange scarcity and were dependent on food aid in the event of crop failure. Intervention was further justified by the need to reduce farmers' risk in promoting Green Revolution technologies. The six countries cited in the studies adopted a set of policies involving procurement from the domestic market and buffer stocking in support of price bands, which were often combined with import restrictions or import monopolies.

However, such measures have by now become obsolete. International grain markets are now better integrated, thanks to improved infrastructure and technological progress. Modern varieties

overwhelmingly dominate grain staple production. Foreign exchange reserves have vastly increased among the six countries cited, dwarfing their respective food import requirements. Moreover, as shown by Dawe (2002), international rice price volatility was lower during the 1985–1998 period, compared to 1961–1981, mainly due to more stable production, deeper world markets, and the profit orientation of major exporters. Unfortunately, the reform agenda remains far from complete as parastatal traders continue to operate at a large scale in several countries (Rashid, Gulati, and Cummings, 2008).

2.3 Alternative Approaches to Food Emergencies

Emergency reserves are not the only instrument for addressing a food crisis. Alternative instruments involve two sets of options: the first set expands reliance on private choice, whether on the demand or supply side; the second involves innovative instruments for managing price risk (Byerlee, Jayne, and Myers 2006). These options are considered below.

2.3.1 Cash-Based Food Assistance

Reliance on private sector trade can be increased by maintaining “reserves” in the form of an emergency cash fund. The WFP generally operates in this fashion; in 2008, of the 3.9 million tons of food distributed, 76% (2.8 million tons) was procured using cash fund (WFP 2009). Going one step further, on the consumption side, social safety net programs for the poor and vulnerable can be in the form of cash rather than food. Cash is easier to store and distribute compared to physical stocks, such as cash transfer through mobile phones or ATM cards. Furthermore, recipients are free to spend the additional purchasing power at their own discretion, thus avoiding distortions associated with in-kind aid.

2.3.2 Trade in Contingent Cash Claims

Insurance is a scheme in which members give contributions to a fund that pays out benefits in case unfavorable contingencies materialize. For example, countries can enroll in a catastrophe risk insurance scheme that provides advanced protection against disaster, as an alternative to *ex post* appeals for emergency aid (ADB 2009). Traditionally, crop insurance was seen as the standard device to protect farmers from yield risk. However, in developing countries, crop insurance is less used due to high cost and unsustainable financing (Wright and Hewitt 1993). As an alternative to crop insurance, innovative financial products have recently been developed such as index-based derivatives, i.e., state-contingent securities in which payments are triggered by some publicly verifiable indicator such as prolonged low rainfall or excessive flooding. While these risk instruments directly offer security to farmers, through interactions with output choice, these eventually may promote food security at the market level by expanding food supply.

2.3.3 Trade in Commodity Claims

A warehouse receipt system introduces actual financial instruments backed by food stocks. To expand private sector participation in the emergency reserve system, a government can opt to maintain stocks in the form of warehouse receipts. Indirectly, the system can benefit food production and trade by facilitating access to credit, as the warehouse receipts may be acceptable to lenders as a form of collateral. Emergency response can take the direct form of sale or distribution of physical stocks (upon redeeming the receipts), or the direct sale of the receipts itself in the secondary market, to tame market speculation. Reliance on private sector

storage may be a lower-cost option than public sector storage, particularly under a business climate that favors private sector development of grain supply chains.

The warehouse receipt system is one avenue toward the formation of forward or futures markets. An over-the-counter *forward* contract is a specific transaction between two parties over the future delivery of a particular commodity under prearranged terms. A futures contract, on the other hand, is a standardized, transferable contract arranging for the delivery of a specific amount of a commodity at a specific date and a specific payment at that later date. That payment is called a futures price, in contrast with the “spot price” for current deliveries and payments. Futures trading is organized through commodity exchanges. As explained in Box 1, the tradability of futures contracts attracts speculators, which enhances the liquidity of the market, favoring core traders who are motivated by making or taking physical deliveries. Lence (2009) shows that hedging induces producers to increase their supplies. Hence, consumers gain from the introduction of futures contracts. However, due to market effects, the benefits to producers are ambiguous as expanded supplies tend to reduce output prices.

The presence of speculation has raised fears that the futures markets may also worsen price volatility and exacerbate risk. Robles, Torero, and von Braun (2009) conclude that speculation was in fact an important driver of recent market volatility in the cereals market. In the case of rice, however, futures trading is very thin; hence, any role that speculation may have had in the 2008 price surge was in the form of physical stocks (Timmer 2010).

Box 1: How the Futures Market Works

A buyer of future deliveries is said to take a “long” position, while a seller of future deliveries takes a “short” position. Hence, a farmer can take a short position and “lock in” the price for future delivery, therefore securing a hedge against falling spot prices. A buyer can likewise lock in future delivery prices and hedge against rising spot prices.

Tradability of futures contracts implies gains (or losses) from changes in the futures price. A holder of a long position can realize gains when the futures price rises, by taking an offsetting short position. For instance, at date T , a long position may entail a promise to buy 100 units, paying \$100 each at some future date $T + 2$. By date $T + 1$, the price at $T + 2$ may have risen to \$110. The buyer then reverses position by making a promise to sell 100 units at \$110 each. Hence, at time $T + 2$ the promise to sell and to buy in terms of commodities nets to zero; the trader receives a price of \$11,000 while paying out only \$10,000, making a margin of \$1,000.

On the other hand, if the futures price were to fall, say to \$90, then the trader going long, loses by reversing position. Similarly, the holder of a short position can realize gains when the futures price falls, by taking an offsetting long position; if the futures price were to rise, the trader going short, takes a loss by reversing position. The potential gains arise from sheer speculation on movements in the futures price; in practice, the trader need not make or receive a physical delivery.

Futures markets, however, may offer an alternative means to contain price variability through a “virtual reserve” scheme (von Braun and Torero 2009). The virtual reserve is a contingency fund that finances a series of short sales in futures markets, whenever futures (and spot) prices exhibit extreme upward movements. The aim is to bring futures prices down. If prices continue to rise, the fund would be needed to finance losses from reversing position or honoring deliveries through spot purchase (as spot prices converge toward futures prices as the delivery date approaches). If the fund is sufficiently large, the virtual reserve scheme could force speculators out of the market. On the other hand, the risk remains that speculation is strong

enough to deplete the fund without preventing a price surge—essentially extending Salant’s (1983) argument from physical to virtual reserves.

Some of these market-based options are admittedly at their nascent stage, and in the near term will play only a minor role in food emergencies. Emergency reserves can be established more quickly as part of an overall food security program. As these alternative institutions develop, so would the role of emergency reserves would evolve in tandem. Real world examples are available on the emergence of emergency rice reserves as a response to food security problems. The discussion, which has focused on conceptual underpinnings, now moves to the experience of implementing emergency reserves at the international level.

3. Emergency Food Reserves: International Experience

3.1 Past Schemes

The current drive for food security cooperation in the aftermath of global market turmoil recalls developments in the 1970s–1980s (Shaw 2007). In 1974, following the World Food Conference in November that year, the United Nations General Assembly endorsed the International Undertaking on World Food Security. The agreement aimed to create a global grain reserve, at both national and regional levels, to be dispersed in strategic locations worldwide. For rice and wheat, the targeted stockpile was 30 million tons. An International Emergency Food Reserve was established under the WFP, with an initial stock of 500,000 tons to be created by voluntary contributions.

In South Asia, in 1987, the South Asian Association for Regional Cooperation (SAARC) composed of Bangladesh, Bhutan, India, Maldives, Nepal, Pakistan, and Sri Lanka established the SAARC Food Security Reserve. The reserve consisted of about 242,000 tons of food grains (mainly rice and wheat).

In Southeast Asia, the ASEAN member countries established in 1979 the Agreement on the ASEAN Food Security Reserve. The agreement noted the “high vulnerabilities of the region to wide fluctuations in the production of basic foodstuffs and hence to instability of the region’s food supply.” It defined the ASEAN Food Security Reserve as the totality of stocks, including national stocks, held “as a matter of policy” to maintain food security in the member countries. The ASEAN Emergency Rice Reserve (AERR) was created to serve as the subset of national stocks voluntarily designated or *earmarked* to address food emergencies throughout the region. Initial earmarks totaled 50,000 tons. The agreement also established the ASEAN Food Security Reserve Board (ASFRB), comprising representatives from each member country. The Ministry of Commerce of Thailand would serve as the ASFRB Secretariat.

Releases of the stock were explicitly conditioned on bilateral negotiation on the part of the countries concerned. That is, a member country applying for a release would first make a direct request to another ASEAN member country—“prices, terms and conditions of payment in kind or otherwise, in respect of rice so released, shall be the subject of direct negotiations between the ASEAN (m)ember (c)ountries concerned.” The ASFRB need only be notified of the request from the emergency reserve.

The agreement also mandated a “food information and early warning system,” based on regular reporting by member countries to the AFSRB regarding “government stockholding policies, and programmes, as well as other aspects of the food supply and demand situation, in particular, rice.” The information would form the basis for situation appraisal and outlook to be circulated to the member countries, but otherwise kept confidential.

3.2 Assessment

Each of these cooperation arrangements, however, turned out to be ineffective. In the case of the International Emergency Food Reserve, the multilateral stewardship of the WFP was trivialized by the essentially bilateral character of food aid from donors to recipient governments. Donors have not fully respected the reserve’s modalities; a large share of contributions have been tied and designated to specific commodities and emergencies. In short, “the world still does not have an adequate international emergency food reserve” as aid remains highly politicized and undersubscribed (Shaw 2007, 160).

In the two food reserve schemes in Asia, no releases were made over the entire period they were in force. In the case of SAARC, the reason was that member countries were reluctant to declare a state of national food emergency (UNESCAP 2009).³

In Southeast Asia, despite the inactivity of the AERR, member states continued to accept the need for food security cooperation. A special workshop in 2001 on food security cooperation and rice reserve management system in East Asia proposed the strengthening of the ASEAN emergency rice reserve, starting with a review of the scheme. The review was supported by the Japan International Cooperation Agency (JICA), the results of which were later contained in a development study (PCI 2002).

The review found that there was a great need to provide mechanisms for short-term relief for food-related emergencies. Rice price fluctuates considerably, in part due to environmental variations such as those caused by the El Niño phenomenon. Natural disasters are also frequent in each of the ASEAN+3 countries, in the form of floods, drought, storms, and seismic activity. *Climate change* looms as a major long term threat to Asian countries; among its more pernicious impacts is the worsening of intensity, frequency, and spread of weather-related disasters. Already Southeast Asian countries have been identified as flood-risk and cyclone-risk hotspots, while Indonesia, Myanmar, and Vietnam are included as drought-risk hotspots. Among the ASEAN+3, Cambodia and Vietnam are seen to be especially vulnerable to flooding and landslides, while vulnerability of PRC to drought and flood is rated as significant to extreme (ADB and IFPRI, 2009).

Despite the need for emergency response, the AERR was inactive because (i) the reserves were too small, equivalent to only 0.4 day consumption of ASEAN countries; (ii) the AFSRB was not able to operate the AERR as a functional entity due to the lack of funds for the secretariat; and (iii) the process of bilateral negotiations simply replicated regular market or government-to-government transactions, rendering multilateral schemes such as the AERR redundant.

The review made some recommendations to be tested under a pilot basis. A long-term target of 1.75 million tons was recommended with respect to reserves, both earmark and stockpile.

³ Recognizing this constraint, SAARC signed a new agreement in 2007 establishing a food bank that would allow withdrawals in the event of a “shortage.”

Several indicators were evaluated to arrive at this target (all are computed net of existing national reserves):

1. Peak supply–demand gap, less the average supply–demand gap;
2. Peak imports, less average imports;
3. Benchmark stock-to-utilization ratio (3% to 5%); and
4. Projected need during a large-scale disaster.

The target figure (1.75 million tons) is based on the first indicator; the other indicators lead to much higher ranges (1.9 million tons–4.2 million tons). The review recommended a gradual accumulation of stocks until the target figure would be reached.

With respect to funding, the study projected a modest amount (maximum of \$500,000) to cover overhead costs, to be raised from ASEAN member countries. With respect to multilateral decision making, the study suggested a number of guidelines on storage and release that were subsequently implemented in the pilot phase of the East Asia Emergency Rice Reserve (EAERR).

3.3 The Case of the East Asia Emergency Rice Reserve

The results of the JICA-supported review and development study (PCI 2002) were presented at a series of technical meetings on rice reserve in 2002. This culminated in the approval of a pilot project during the Third Meeting of AMAF+3 to establish the EAERR. Its implementation was proposed for a 3-year period from 2003, which was subsequently renewed for another 3-year period until February 2010.

The overall supervisory body of the EAERR is the Project Steering Committee that reports to AMAF+3. Day-to-day operations are conducted by the Management Team (MT–EAERR). The EAERR is funded by the Ministry of Agriculture, Forestry and Fisheries of Japan as well as in-kind contributions from ASEAN member states, mostly from the Ministry of Agriculture and Cooperatives (MOAC) of Thailand, which hosts the MT–EAERR office.

The EAERR distinguishes between two types of reserve: the earmark, which is defined as being under the AERR; and the stockpile, which is rice stocks or cash contributions donated to the rice reserve. Releases from the earmark can be made under Tier 1 or Tier 2 assistance. Under Tier 1, releases are made under a special commercial transaction. The MT–EAERR evaluates the degree of emergency and provides a supply–demand matching service between deficit member countries “that frequently experience disaster/emergency situations” and member countries with a rice surplus. In this way, the MT–EAERR effectively functions as a market intermediary or broker. Under Tier 2, the terms of release are governed by a loan or grant agreement from the earmarking country.

The release from the stockpile, called Tier 3, is intended to meet the acute emergency needs of disaster victims, on grant terms. The receiving country is expected to defray the logistics and distribution costs, unless the donor or some other agency agrees to provide additional financial support. A Tier 3 release is initiated by a request from a member country or an international organization (such as the WFP); the MT–EAERR evaluates the request, while the Project Steering Committee makes the final approval.

The EAERR piloted the implementation of the Tier 3 program in Cambodia, Indonesia, Lao PDR, and the Philippines. Over a 5-year period (2005–2010), nearly 3,000 tons of rice were

distributed as food relief. Much of this amount was procured using cash donations from the Japanese government. One in-kind donation of 520 tons of rice from Thailand was sent to the Philippines to assist the victims of Typhoon Ketsana.

The implementation of the EAERR has led to a tremendous increase in the size of the earmarked reserves (Table 3), compared to the initial level of AERR stocks, mainly because of the contributions of the Plus Three countries. One pilot test of the Tier 1 release involved a 10,000-ton rice shipment from Viet Nam to the Philippines in early 2010. The shipment was executed as a purchase agreement between the National Food Authority (NFA) of the Philippines and the Vietnam Southern Food Corporation (VINAFOOD 2), the largest rice exporter of Viet Nam. The order was used by the NFA to meet relief and rehabilitation requirements after a series of typhoons battered the Philippines in late 2009. The purchase agreement was negotiated based on prevailing international prices and standard rice trade practice.

To summarize, the EAERR represents a marked improvement over the AERR. Multilateral decision making is now better emphasized, and unlike past schemes, actual releases have been made in response to disasters. The EAERR receives strong financial and in-kind support from at least two member countries, while serving as a regional forum for food security cooperation. Following the favorable experience of the EAERR pilot project, the establishment of a permanent reserve scheme called the ASEAN Plus Three Emergency Rice Reserve (APTERR) is now under way.

Table 3: Initial Earmark of Stocks for Emergency Reserve by Member Countries, in tons

Country	Earmarked stock	
	AERR (1979)	EAERR
ASEAN		
Brunei Darussalam	–	3,000
Cambodia	–	3,000
Indonesia	12,000	12,000
Lao PDR	–	3,000
Malaysia	6,000	6,000
Myanmar	–	14,000
Philippines	12,000	12,000
Singapore	5,000	5,000
Thailand	15,000	15,000
Viet Nam	–	14,000
Plus Three		
PRC	–	300,000
Japan	–	250,000
Republic of Korea	–	150,000
Total	50,000	787,000

AERR = ASEAN Emergency Rice Reserve, ASEAN = Association of Southeast Asian Nations, EAERR = East Asia Emergency Rice Reserve, Lao PDR = Lao People's Democratic Republic, PRC = People's Republic of China.
Source: Agreement on the ASEAN Plus Three Emergency Rice Reserve (2011).

After rounds of negotiations, ASEAN member countries have approved a final draft agreement signed in the AMAF+3 meeting in October 2011. Under the agreement, countries will commit to the principles of mutual assistance during times of food emergency, which involve information sharing, earmarking, and stockpiling, as previously implemented under the AERR agreement and the EAERR project. "Emergency" is defined in the same terms as in the ASEAN Integrated Food Security (AIFS) Framework. The agreement formalizes the earmarking pledges of Table 3.

It also provides for a permanent institutional framework for APTERR: a governing council consisting of country representatives, decision making by consensus, and a secretariat to undertake day-to-day management of the reserve program. The agreement also provides for financial contributions for the regular support of overhead costs of APTERR.

APTERR addresses the problems that had earlier constrained the ASEAN Food Security Reserve (sections 3.1 and 3.2). The size of the reserve has been dramatically increased; its day-to-day management under a secretariat will be fully funded by member country contributions; and decision making on releases from the reserves is now multilateral (although there remains considerable scope for bilateral negotiation among transacting countries). Nevertheless, the agreement lacks specifics on program strategies and operational details, which have been relegated for internal discussion among the APTERR Council members. Defining these strategies underscores the sets of challenges that confront APTERR for it to be fully functional and sustainable.

4. Challenges Facing the ASEAN Plus Three Emergency Rice Reserve

4.1 Technical Issues

The first set of challenges relates to technical issues on the release and storage of stocks. The stockpiled reserves of APTERR are aimed at providing humanitarian food relief for localized emergencies; this more closely corresponds to the emergency reserves being recommended to counter food crises (FAO et al. 2011). The amount of stockpiled reserves will likely remain modest due to the high financial cost of accumulating reserves as well as the cost of storing physical stocks. Nevertheless, APTERR would clearly benefit from a strategy of raising a suitable level of stockpiled reserve as well as identifying the appropriate forms and locations of storage, to provide immediate assistance for disaster victims in the throes of a food emergency.

As recommended in an evaluation report commissioned by the EAERR (PricewaterhouseCoopers 2008), the reserve scheme should move more aggressively on the releases from earmarked reserves, as these represent APTERR's biggest resource to overcome food emergencies. Earmarked reserves may be targeted to address market-wide disruption, such as a sudden food availability gap at the national level or an extreme price spike.

Procedures need to be streamlined to make emergency response more tangible. It is anticipated that Tier 1 will offer a sustained basis for effective food security cooperation. However, greater clarity is needed on mechanisms authorizing release, as well as the determination of price and other terms and conditions of the Tier 1 transaction. The mechanism should be sensitive and responsive enough to act rapidly, particularly if a purely domestic reaction (such as importing via regular channels) may be too sluggish.

However, release triggers that are *too* sensitive may lead to large-scale withdrawals from earmarked reserves in excess of actual requirements. This raises concerns about potential distortions to normal international trade. Food aid from developed countries has been traditionally criticized as a means of dumping food surplus in developing countries (Barret and Maxwell 2006). The World Trade Organization (WTO) Agreement on Agriculture and the

FAO Principles of Surplus Disposal and Consultative Obligations have provisions precisely to prevent this. There is a need to more accurately distinguish “emergency” in relation to “normal trade” as a condition for the release of APTERR stocks, to prevent these trade distortions and to assure WTO compliance.

Clearly, trigger and release procedures under APTERR must be guided by a food emergency monitoring and information system. The existing ASEAN Food Security Information System (AFSIS), hosted by the Office of Agricultural Economics (OAE) of the MOAC of Thailand, may be one of the mechanisms to support APTERR’s information and monitoring requirements. Others may include the AFSRB (which also has a mandate for food security information and assessment), and ASEAN dialogue partners such as the WFP and FAO. APTERR needs to develop these linkages to facilitate information exchange and build its analytical capability for a more proactive and systematic implementation of emergency food response.

4.2 Financial and Economic Issues

The second set of issues is financial. While countries have agreed to support the overhead costs of APTERR, providing funding for programs and operations is a different matter. The challenge now is to mobilize strong financial support from all ASEAN+3 member countries, based on the ability to pay and other criteria. For example, Tier 3 assistance has been largely supported by Japan, with significant support from Thailand. A broader base of participation, however, is needed. There are a number of regional organizations that are sustained by periodic funding from member countries, but only because the latter are convinced of the benefits of participation.

A credible benefit–cost analysis may be useful for mobilizing this support. The analysis of benefits may also be useful to determine the optimal size of reserves based on the approaches outlined in the Annex. This can also assist member countries in evaluating the appropriate level of their national buffer stocks in relation to the regional reserve as well as the need to impose controls and restrictions, whether on the export or import side, on normal trade.

Member contributions are not the only means to raise resources. There may be other mechanisms to recover costs or to make benefits conditional on payments. For example, the WFP charges a modest management fee, usually paid by the donor country. After a feasibility study of cost recovery options, the more viable schemes can be incorporated into the business model of APTERR to ensure its financial sustainability.

4.3 Legal and Institutional Issues

The third set of issues is institutional. Both the regional reserve and the national stock agencies should achieve some level of organizational capacity; on the distribution side, the logistic and market infrastructure should also meet some minimum standards for intended benefits to be realized once a release from the reserve is made. The institutional prerequisites also cover the harmonizing of laws, policies, and regulations among the member countries to facilitate food security cooperation and the rapid movement of rice stocks. Releases from the reserves may be impeded by unclear and inconsistent national regulations and guidelines (PricewaterhouseCoopers 2008). For example, Tier 3 assistance to Indonesia encountered some legal problems on the tax-free treatment of donated rice. The Tier 1 release from Viet Nam to the Philippines was delayed by a few years due to legal obstacles on both the side of Viet Nam and the Philippines. Any effort to establish a permanent APTERR should anticipate problems with respect to such preconditions and to plan accordingly.

Relationships with other agencies would also need to be reexamined. The alternative to food aid from APTERR is food assistance from other sources, such as the domestic emergency reserve or from international aid. The EAERR mostly relied on national agencies for distribution, but collaborated with the WFP on a few Tier 3 releases (notably, Indonesia and Lao PDR). As APTERR would likely be limited to procuring rice stocks, it would need to study how to expand engagement with distribution agencies.

There are now proposals for effectively reviving the global emergency food reserve (e.g., FAO et al. 2011). However, based on past experience (section 3.1), a multilateral initiative at this level is difficult to sustain. Fan, Torero, and Headey (2011), cognizant of such difficulties, suggest that such a grain reserve system commence on an experimental basis with small reserves, specifically citing APTERR as an example of such an experiment. APTERR can therefore play a pioneering role in establishing international grain reserves. Partnerships with other regional initiatives (such as the SAARC food bank) may be another modality toward the future creation of a truly global grain reserve.

Another external linkage that needs to be explored is the relationship with the private sector. The evaluation report observes that, as Tier 1 releases are based on commercial contract, commercial players may be interested to join the program. Other areas where private sector services can be engaged are in the storage of reserves, the logistics of delivery and distribution, and even in the management of the reserve scheme itself. Note that the public good argument justifies public sector procurement, not necessarily public sector provision of the services of an emergency food reserve.

Finally, as discussed in section 2.3, APTERR would need to position itself in relation to other market-based instruments to firmly address food insecurity. These innovations may help define the scope of emergency rice reserves. For example, if the APTERR stockpile were to include a larger share in the form of cash contribution, these other instruments may offer more options for addressing food emergencies in the region. These could also include forward and futures contracts and their variants, i.e., commodity options. In the region, a number of stock and commodity exchanges accept futures contracts, e.g., the Agricultural Futures Exchange of Thailand (Box 2), the Bursa Malaysia, the Jakarta Futures Exchange, the Republic of Korea Exchange, the Shanghai Futures Exchange, the Singapore Commodity Exchange, and the Tokyo Grain Exchange. Prospects for future inclusion of rice futures in existing commodities exchange will need to be looked at.

Currently, the futures market in Southeast Asia is in its infancy. Based on the experience of the pilot project, Tier 1 can be conducted on the basis of contingent forward contracts. That is, APTERR will guarantee to release rice immediately to a country, provided that it is undergoing (or about to undergo) a national food emergency (such as one which may be caused by a large-scale domestic supply shock, or even global-scale market volatility). Institutionalization of the forward contract scheme under Tier 1 could lay the basis for a region-wide commodity exchange, with a flexible menu of options with respect to delivery, pricing, risk hedging, and contractual or even sovereign guarantees. A permanent scheme on emergency rice reserve should remain flexible and adaptive to a changing set of market conditions and financial institutions.

Box 2: The Agricultural Futures Exchange of Thailand

One of the more advanced exchanges for agriculture in the Association of Southeast Asian Nations (ASEAN) region is the Agricultural Futures Exchange of Thailand (AFET), which was established in 2004, following the legislation of the Agricultural Futures Trading Act of B.E. 2452 (C.E. 1999). AFET covers rubber, cassava, and rice. It has developed standardized contracts, designating product specifications and delivery terms. In the case of rice, the standard involves units of 15 tons of white rice (5%). Growth has been rapid—contracts traded grew at an annual rate of 14% from 2004 to 2007. However, the market remains thin, as rice traded totaled just 307,000 tons in 2007. Moreover, contract settlement is allowed on cash basis; hence, the actual delivery is much lower than this (AFET 2007). Other factors preventing rapid growth are the baht-denomination of transactions, nationality restriction, the ignorance of exporters regarding the futures market, and pervasive government intervention in rice that discourages private participation.

Source: Briones (2009).

4.4 Concluding Remarks

ASEAN+3 member states have generally implemented aggressive domestic policies to combat food security threats. However, a regional and multilateral approach to food security requires renewed commitment among all the member states. Currently, the agreement on the ASEAN+3 emergency rice reserve is strong on the principles of cooperation, but short on specifics. While the experience of the EAERR would be invaluable in applying lessons learned, APTERR would have to operate significantly beyond the level of a pilot scheme. This review points out the directions for further analysis, research, and evaluation, toward a functional and sustainable emergency reserve for the member countries of the ASEAN+3.

Annex: Modeling Optimal Reserves

The foregoing discussion makes clear that emergency reserves should not be managed in the same manner as buffer stocks. Rather, emergency reserves should target vulnerable populations in times of crisis, and should be limited to relatively small releases that would not disrupt normal private sector market development (FAO et al. 2011). However, maintaining modest levels of reserves for emergency purpose is still costly; the appropriate level of reserves involves balancing off food security benefits against storage costs. In practice, some rule of thumb is observed. The Philippines, for example, maintains a year-round strategic rice reserve contained in government depots, equivalent to 15 days of national rice consumption. The other target is a rice buffer stock (which includes the strategic rice reserve), equal to 30 days of national consumption that is accumulated every 1st of July.

Another measure may be the stock-to-utilization ratio, which is the ratio of beginning stocks to total annual utilization (covering food and other uses). FAO has traditionally set at a benchmark of 17%–18%. A stock-to-utilization ratio below this is an early warning of food insecurity (FAO Committee on World Food Security 2001). The reserve may then be set to cover the gap between the benchmark and actual ratio. Several other guidelines are in use (PCI 2002):

- Reserve = Peak imports – Average imports. *Peak imports* are the highest imports observed over a time series, while average imports are a simple average over the past 5–7 years.
- Reserve = Peak deficit – Usual Marketing Requirement (UMR). *Peak deficit* is the largest gap between domestic production and utilization observed over a time series; UMR is the gap between domestic production and utilization, averaged over the past 5–7 years.
- Reserve = Disaster requirement. Disaster requirement = (number of persons affected in a large-scale disaster) x (per capita consumption) x (number of days external food assistance is needed).

However, none of these guidelines apply welfare analysis to value benefits, or take into account costs of storage. These guidelines are “rules-of-thumb” rather than rigorous attempts at computing the optimal reserve level. An approach that explicitly incorporates benefits, costs, and optimality considerations applies dynamic optimization, formulated along the lines of the following problem:

$$\begin{aligned} 1. \quad & \max_{u_t} \sum_{t=1} \beta^t f(x_t, s_t, u_t) \\ 2. \quad & \text{s.t. } s_t = g(s_{t-1}, x_t, u_t) \end{aligned}$$

In both formulas, t denotes the time period; β , the parameter representing the discount rate; s , a state variable; x , an endogenous variable; and u , a control variable. The pay-off function and state equation are respectively denoted by f and g . The problem readily extends to the stochastic case (e.g., Stokey, Lucas, and Prescott 1989), where x_t represents a random variable (typically assumed to follow a Markov process), and where the pay-off function can be represented by an expected utility.

An application for optimal storage is based on Love and Buccola (1993); a more general model is found in Wright (2001). In the third formula below, let E_t be the expectations operator; p_t , the market price; s_t , the quantity of reserves; u_t , the amount released from the reserves; $v(p_t)$, a monetary measure of consumer utility, with consumers approximated by the total willingness-to-pay (the sum of consumer surplus and total revenue); $TC(p_t)$, the indirect cost function of the producer; and R , the cost of storage. Abstracting from other costs, the storage problem can be stated as follows:

$$3. \quad \max_{u_t} \sum_{t=1}^T \beta^t E_{t-1} [v(p_t(u_t)) - TC(p_t(u_t)) - R(s_t)]$$

$$\text{s.t. } s_t = s_{t-1} + u_t$$

Here, $p_t(u_t)$ is a function that relates the *equilibrium* price with releases, and is therefore a reduced form involving interactions of supply and demand functions, in which a random error term may be embedded.

These models involve continuous functions and do not incorporate threshold effects, which based on our earlier discussion are integral to food security. To some extent, this can be addressed by Love and Buccola's suggestion on changing the objective function in the third formula to a "policy preference function" reflecting political mandates, say, a target maximum price.

Another option for introducing threshold effects on the objective function is presented by Myers (2006). In the fourth formula below, given household income, y_t ; a welfare measure, m ; and a no-intervention price path, p_t ; let the asterisk * denote the variables under a stabilized price path. For now, assume that each price path is achieved through a scheme of storage and release of food stocks. The welfare measure can be computed implicitly as

$$4. \quad \sum_{t=1}^T \beta^t E_0 v[p_t, (1+m)y_t] = \sum_{t=1}^T \beta^t E_0 v[p_t^*, y_t^*]$$

That is, m is estimated as the proportional amount of additional income in each period that would make the household indifferent between a no-intervention price path and a stabilized price path. In the fifth formula below, the model introduces a threshold effect by letting π denote the probability that a household survives. In case the household dies (with probability $1 - \pi$), utility falls discontinuously to zero. Survival probability is in turn affected by price; the survival probabilities corresponding to fluctuating and smoothed price paths are, respectively, π and π^* , with $\pi^* > \pi$. The benefit from stabilization is indexed by m_s , computed as follows:

$$5. \quad \sum_{t=1}^T \beta^t \pi_t E_0 v[p_t, (1+m_s)y_t] = \sum_{t=1}^T \beta^t \pi_t^* E_0 v[p_t^*, y_t^*]$$

Under simplifying assumptions and suppressing the time index, m_s can be approximated using Taylor expansion, leading to the expression

$$6. \quad m_s \approx m + \frac{\pi^* - \pi}{\pi \cdot (1 - \rho)}$$

Here, m is the traditional welfare measure that is conditional on household survival (i.e., no threshold effect); ρ is the household's coefficient of relative risk aversion, $0 < \rho < 1$. Myers shows that the welfare impact of increasing survival probability would tend to dominate the traditional welfare measure m . For instance, a 1% reduction in the probability of survival, given $\rho = 0.8$, implies an additional welfare cost of 5% of income—a quantitatively significant result. In principle, this framework may be applied to calculate the benefit from alternative price paths, with and without intervention; together with information on costs of stabilization, the method can lead to the formulation of an optimal reserve scheme.

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Regional Cooperation for Food Security

The Case of Emergency Rice Reserves in the ASEAN Plus Three

After the food price crisis in 2008, interest in international emergency food reserves has been revived worldwide. In this paper, Roehlano Briones presents the rationale for an international emergency food reserve, its role in mitigating food security risk in relation to alternative instruments, and its complementarity with normal international food trade. He then reviews international experience in emergency food reserves, focusing on the Association of Southeast Asian Nations (ASEAN) and neighboring countries, and discusses the case of the ASEAN Plus Three Emergency Rice Reserve, established in October 2011. The paper identifies practical challenges facing the operation of emergency food reserves, and outlines a corresponding agenda for policy setting and research.

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