

Overcoming the World Food and Agriculture Crisis through Policy Change, Institutional Innovation, and Science

by

Dr. Joachim von Braun

Director General

International Food Policy Research Institute, Washington

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Progress Through Science

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Avenue II, Indian Agricultural Research Institute

New Delhi-110012



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Overcoming the World Food and Agriculture Crisis through Policy Change, Institutional Innovation, and Science

Joachim von Braun

**Director General, International Food Policy
Research Institute, Was**

**Trust for Advancement of Agricultural Sciences (TAAS), Fourth
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The world is currently in a deep economic recession, which follows in the footsteps of an international food price crisis. To understand the impacts and overcome these crises, it is critical to address some key questions: What is the role of agriculture in mitigating economy-wide effects and poverty? What should be done to strengthen the potential role of agriculture and the small-farm sector in reversing the decline of economic growth? And with respect to both these questions, how to act?

Today's world food situation is shaped by volatility of food prices, low growth in agricultural productivity, and severe constraints to access of investment capital for agriculture in many countries. The sharp rise in global food prices in 2007–08 severely undermined the nutrition security of the poor, provoked social and political instability, and increased competition for limited natural resources. The crisis, however, also renewed the focus on food and agriculture on national and global agendas, after decades of policy neglect and underinvestment in agricultural science, rural infrastructure, and institutions. India has responded strongly to the challenges in the world food system with policy actions that will be discussed here in a global context.

Throughout the world, policymakers and the public long for simple solutions of these complex problems, but unfortunately, there are none. At the same time, some misguided policy actions have deepened the crises by threatening the open exchange of ideas, information, services, and goods. The globalization of the agrifood system which—in other words, the integration of the production and processing of agriculture and food items across national borders through markets, standardizations, regulations, and technologies (von Braun and Diaz-Bonilla 2008)— could be reversed. Borders have been closed, for example to the trade of food in 2007-08, and ears have been

shut to reasoning by dogmatic forces. However, we should remember the good words of Mahatma Gandhi “...I do not want my house to be walled in on all sides and my windows to be stuffed. I want the cultures of all lands to be blown about my house as freely as possible...”.

As policymakers consider options for overcoming the crises and reviving agriculture development, the following patterns of consensus, and lack of consensus, are evident:

- First, there is wide agreement that *innovations in agricultural practices and science* have crucial roles to play in boosting agricultural growth, coping with and recovering from the current world food crisis, as well as preventing similar crises in the future.
- Second, there is also broad agreement that science alone cannot change the world food situation, but that *institutional innovation and change* must facilitate farmers’ profitable use of science and technology by reducing the transaction costs of gaining access to innovations. Institutions in this context are understood as the “rules of the game,” and include laws and regulations, not just organizations.
- Third, however, there is little agreement about the *best designs of these institutional arrangements*. These relate for instance to the institutions that define scale in farming and food industries; contract and cooperation choices; roles of public and private sectors along the food value chains; market and trade arrangements; taxation, subsidies, and pricing; public sector functions in agriculture at central versus local government levels; and civil society’s roles.
- Fourth, while there is underinvestment in food and agricultural science and technology—*innovation in institutional arrangements are lagging behind even more*, and hinder progress in the uptake and use of technology and in reducing hunger through public and market-based actions.

An international perspective on these issues is taken here, with some focus on South Asia’s rich experiences. The discussion of these issues is connected to a policy proposal to overcome the world food and agricultural crisis, composed of three sets of needed complementary actions:

- (1) promote agricultural growth,
- (2) reduce market volatility, and
- (3) expand social protection and child nutrition action.

Each of these policy actions needs to be enhanced by science, by institutional innovations, and by evidence-based policy advice. Policy, in turn, needs to define strategies and implementation pathways to spur the needed innovations and fill information gaps.

I. The Food Price Crisis and Its Impacts

Driven by rapid growth in food and energy demand, agricultural supply constraints, and speculation, the world price of almost every agricultural commodity sharply increased in 2007 and 2008. At their peaks, world rice prices increased fivefold and wheat and maize prices tripled compared with their levels at the beginning of 2003 (FAO 2009a). At the country level, these global food price changes have been transmitted to different degrees owing to domestic policies and market structure. In many developing countries, including the countries in South Asia, food price increases led inflation dynamics because of the large share of food in the consumption basket (Fig. 1). Upward pressure on overall inflation had adverse macro-economic effects and increased uncertainty.

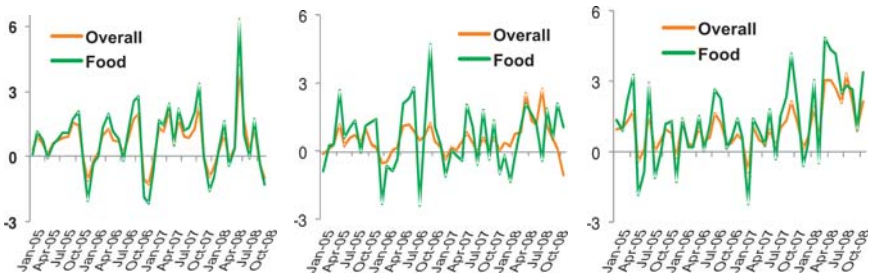


Fig. 1. Food and overall inflation, month-to-month change (%).

Source: Based on data from ILO 2009 and Ministry of Commerce and Industry of India 2009.

Note: Inflation for Bangladesh and Pakistan is based on consumer prices, and inflation in India is based on wholesale prices.

Some countries, such as India, used subsidy, trade, and tariff policies to absorb much of the shock in global food prices. Indeed, wholesale rice and wheat prices in India increased by 30 percent from the beginning of 2003 to October 2008 (Ministry of Commerce and Industry of India 2009). Many least-developed countries, however, had fewer resources to respond in a

similar manner and many were hard hit by measures such as export restrictions on agricultural commodities of major producers. Indeed, countries that imposed export restrictions may have reduced their own risk of food shortage in the short term, but they hurt import-dependent trading partners and made the international market smaller and more volatile.

Slowing demand and higher production have now eased the food price spike. International cereal prices have fallen by about 40 to 60 percent from their peaks, but they remain high compared with a couple of years ago. In some regions, such as East Africa, prices have actually not declined much.

Impacts on the poor and hungry : Even before the food crisis hit, roughly 160 million people were living in ultra poverty, on less than 50 cents a day (Ahmed et al. 2007). The number of undernourished people in developing countries has been increasing and is largest in South Asia. The 2008 Global Hunger Index (GHI)¹ shows only a slight improvement in the overall world hunger situation since 1990 (von Grebmer et al. 2008). When Indian states are compared with the 88 countries in the GHI, their rankings range from 34th (Punjab) to 82nd (Madhya Pradesh) (Menon, Deolalikar, and Bhaskar 2008). Child undernutrition in India is particularly grave. India is home to 40 percent of the world's malnourished children and 35 percent of developing countries' infants born with low birth weights (von Braun, Ruel, and Gulati 2008).

According to preliminary estimates of the Food and Agriculture Organization of the United Nations (FAO), the number of undernourished people increased from 848 million to 963 million between 2002–05 and 2008, largely because of the food price crisis (FAO 2008a). Food price hikes have also worsened micronutrient deficiencies, with negative consequences for people's nutrition and health, such as impaired cognitive development, lower resistance to disease, and increased risks during childbirth for both mothers and children. In Bangladesh, for example, a 50 percent increase in the price of food is estimated to raise the prevalence of iron deficiency among women and children by 25 percent (Bouis 2008). Indeed, food crises affect women more deeply and for longer because they more often lack the income and assets that could help them cope with the crisis than men (Quisumbing et al. 2008). With the cost of food and other essentials increasing, people have taken to the streets in protest. Social and political unrest has

¹The GHI is a combined measure of three equally weighted components: (1) the proportion of undernourished as a percentage of the population, (2) the prevalence of underweight in children under the age of five, and (3) the under-five mortality rate. The 2008 GHI is based on data until 2006 – the last year with data available at the time of publication.

occurred in more than 60 countries since the beginning of 2007, with some countries experiencing multiple occurrences and a high degree of violence. The protest frequency by month shows a high correlation with international grain prices, especially the price of rice (Fig. 2).

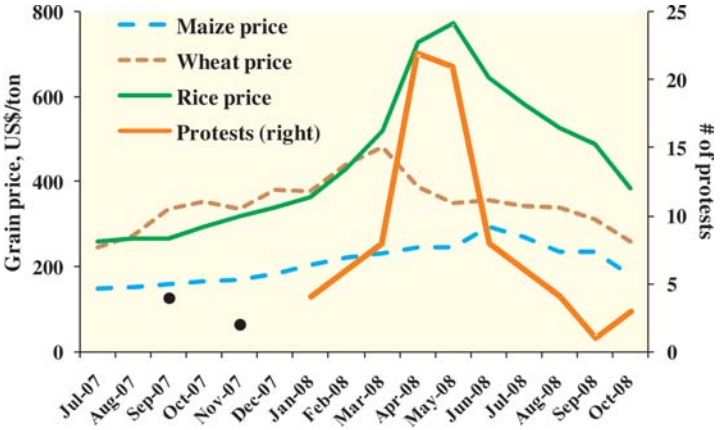


Fig. 2. Food protests and grain prices, 2007-08.

Sources: Compiled by IFPRI; food protests data are from news reports; grain price data are from FAO 2009a.
 Notes: Food protests are defined as strikes, protests, or riots on food or agriculture-related issues.

The global financial crisis and recession are now adding to the burden on the poor. Wages are lost as jobs are cut around the globe. Many small farmers who took advantage of rising agricultural prices to invest in agricultural technologies find themselves unable to pay off their debts. Compared with previous crises, the recent financial crisis has affected many more of the poor in all corners of the world, because a large share of the most vulnerable people is dependent on wages. Also, given that children’s undernutrition affects their physical and cognitive development and has implications for their earnings as adults, the crises will have long-lasting negative implications for people’s economic prospects long after prices come down and the credit crunch is resolved. If the recession is not overcome quickly and investments in agriculture are not accelerated, the consequences could be severe.

IFPRI estimates that recession and reduced investment in agriculture would raise international grain prices by 30 percent and push 16 million more children into malnutrition in 2020 compared with continued high

economic growth and maintained investments (Fig. 3). At a global scale, the decline in investments leading to cuts in agricultural supply seems to be stronger than the demand decline due to the recession. These trends might soon put again strong upward pressure on food prices.

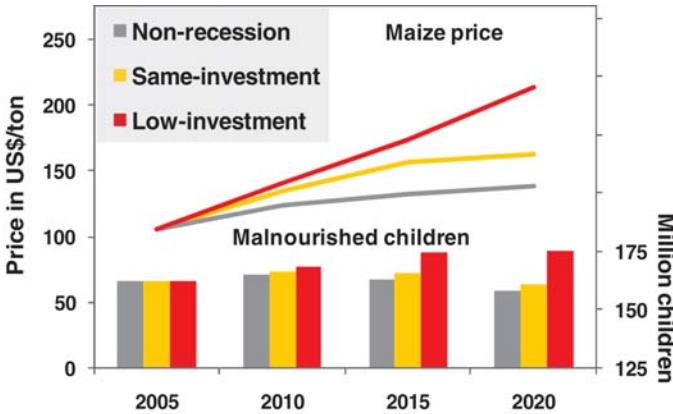


Fig. 3. Recession scenarios with and without agricultural investment action.

Source: Results of IFPRI IMPACT scenario analysis, von Braun 2008.

Impacts on agriculture and natural resources : Underinvestment in public goods—such as agricultural research, science and technology, rural infrastructure, and information and monitoring—has impaired agricultural productivity and production growth as demand for food has risen rapidly. Indeed, annual world cereal yield growth has declined from about 3 percent in the 1960s and 1970s to less than 1 percent since 2000 (World Bank 2007). Total factor productivity (derived from the ratio of total output growth to total input growth) in developing countries grew by 2.1 percent per year from 1992 to 2003 on average. In some regions growth was higher, averaging 2.7 percent in East Asia and Latin America, but in South Asia, the annual rate of growth was even lower—only 1 percent (Table 1). In India, public investment in agricultural research equals only about 0.5 percent of agricultural gross domestic product (GDP), which is lower than the 0.7 percent average for developing countries and the 2–3 percent average for developed countries (von Braun et al. 2005). In 2005–07, cereal yields in India grew on average by 2.5 percent a year (FAO 2009b).

High food prices in 2007–08 and favorable weather provided incentives for agricultural expansion, but most of the increase in output has occurred

Table 1. Total factor productivity growth in developing-country regions, 1992–2003.

Region	Average annual growth (%)				
	1992–94	1995–97	1998–2000	2001–03	1992–2003
East Asia	5.0	4.5	-1.1	2.5	2.7
South Asia	1.7	-0.2	1.2	1.4	1.0
East Africa	-1.7	2.0	0.2	1.3	0.4
West Africa	1.8	2.5	2.4	-0.1	1.6
Southern Africa	0.4	3.3	3.6	-0.6	1.3
Latin America	1.8	2.0	2.9	4.3	2.7
North Africa and West Asia	-0.1	1.9	1.5	2.8	1.4
All regions	2.8	2.7	0.6	2.5	2.1

Source: von Braun, Fan, et.al. 2008.

in developed countries. Many developing countries have been unable to generate the desired production response. If Brazil, China, and India are excluded, total cereal production in the rest of the developing countries actually fell by 1.6 percent in 2008 (FAO 2008b). In India, the grain harvest was particularly good—213 million tons in 2007–08 compared with 194 million tons in 2006. Now, however, as capital becomes more expensive and scarce, plans for investment in agriculture across the globe are at risk of being postponed or scaled back.

Pressures on natural resources, combined with increasing distrust in the functioning of regional and global markets in the wake of the price crisis, have led to increased new forms of government-to-government foreign direct investment in agriculture. A number of countries, many with severe natural resource constraints but rich in capital, have turned to overseas investment in agriculture to secure domestic supply. According to news reports, Qatar, Jordan, Kuwait, and the United Arab Emirates have invested in Sudan; India and Kuwait have invested in Burma; China has invested in Mozambique, the Philippines, and Zimbabwe. These agreements help reduce underinvestment in agriculture, but recipient countries need to negotiate contracts wisely and establish an enforceable code of conduct, including rules about sustainable management of natural resources, engagement of local producers, and respect for customary property rights.

II. India's Response to the Food Crisis

After reaching impressive rates of 9–10 percent a year in 2006–07, economic growth in India slowed to 7 percent in 2008 owing to the recent world food and financial crises and is projected to decline to 5 percent in 2009 (IMF 2009). As further recession challenges arise, agriculture has an increasingly important role to play in India's economic development. Agricultural growth has been low on average, with annual growth in 2004–06 at below 3 percent (World Bank 2008), and average farm size in India has been decreasing. To overcome the crisis, agricultural growth needs to be revived, with the active involvement of the small-farm sector.

India's quick and comprehensive response to high world food prices and its good grain harvest in 2007–08 made the immediate impact of the crisis less drastic than in other countries. Indian policymakers saw that at a time of high global food prices, cereal productivity growth in India had been slowing down. In response, India imposed export restrictions on major grains; expanded subsidies on crude oil, fertilizers, and food; and sustained safety net programs such as the Public Distribution System (PDS) and the National Rural Employment Guarantee Scheme (NREGS) (Gulati and Dutta 2008). Some of these responses, such as export controls on rice and wheat and withdrawal of these cereals from the futures markets, actually bumped up global prices, especially for rice. India must reverse this protectionist trend in order to avoid threatening the domestic benefits of its liberalization of agrifood markets in the 1990s and to prevent harm to importing partners. Unlike other countries, India accumulated large grain buffer stocks both before and during the crisis. With grain stocks of more than 35 million tons in 2008, India has already surpassed its estimated stock norm by 10 million tons and is projected to increase its stocks further to 39 million tons this year (FAO 2009c). An institutional arrangement is needed to govern the appropriate level of stocks and their timely release to reduce food market volatility. In terms of stocks, India is now a potential global food player, and can have a significant role in a new policy regime of coordinated grain reserves policy (see Section IV).

As a step in the right direction, the government of India increased its investment in agriculture and social protection by 24 percent in its 2008 budget (India Ministry of Finance 2008). To enhance food security, it established a National Food Security Mission in August 2007 with the goal of sustainably increasing agricultural productivity and production. Focusing on the eastern part of the country, the scheme aims to raise production of

rice by 10 million tons, wheat by 8 million tons, and pulses by 2 million tons by 2011–12. Given that productivity on irrigated land is almost double that on rainfed land, the government plans to substantially improve irrigation systems. In its 2008 budget, the government raised the allocation to irrigation by 80 percent. This irrigation investment needs to be accompanied by institutional and price reforms.

Further, India has maintained and expanded its safety nets in the context of the food price crisis. Food and fertilizer prices have remained constant in nominal terms and declined in real terms. Issue prices are now almost half of the open market prices. In addition, the NREGS introduced in 2006–07 was scaled up substantially. In February 2009, the scheme's allocation was increased from US\$ 3 billion to \$6 billion. Although these programs have cushioned some of the negative impact on the poor, they come at a high cost. The PDS food and fertilizer subsidy, for example, increased to almost \$20 billion, raising the budget deficit.² The targeting mechanisms, coverage, and cost-effectiveness of many safety net programs are not always optimal and need to be revisited (von Braun et al. 2005). Child malnutrition issues in particular need to be addressed with institutional innovations.

III. The Role of Science and Institutional Innovation in Responding to the Food Crisis

Technological breakthroughs, and their adoption on a large scale as in the Green Revolution in Asia in the 1960s and 1970s, have been critical in preventing Malthusian outcomes. Yet agricultural growth in many developing countries continues to be hampered by lack of appropriate agricultural technologies, immense institutional constraints, and serious problems with the organization and management of agricultural systems.

Agricultural technology, with only a few exceptions, is not an easy candidate for leapfrogging, and it requires substantial joint investments in areas such as rural education, infrastructure, and extension services. Thus, innovations in technology need to go hand in hand with innovations in policies and institutions that can boost growth. Innovations are critical for improving the livelihoods of smallholder farmers and reducing poverty and hunger in general (Asenso-Okyere, Davis, and Aredo 2008). These include innovations in

- organizations for agricultural research, extension, education, input supplies, marketing, and collective action;

²Discussion based on information from Ashok Gulati, February 2009.

- technologies along the whole food value chain;
- institutions, including laws, regulations, traditions, customs, beliefs, and norms; and
- public policies affecting all of these organizational, technological, and institutional arrangements.

New institutional arrangements should be actively designed to help reduce the cost of scientific research, add value to research by facilitating innovation, and enhance the impact of research on smallholders and other marginalized groups in developing-country agriculture (Spielman, Hartwich, and von Grebmer 2007). Institutional innovations can also play important roles in strengthening markets for commodities produced, bought, and sold by smallholders: reducing transaction costs; managing risk; building social capital; enabling collective action; and redressing missing markets. It is increasingly clear that the institutional infrastructure to facilitate market exchange is a critically important policy area to countries recently experiencing the shortfalls of market liberalization, specifically for smallholder agriculture. When market information and markets themselves are not accessible to the rural poor, farmers capture little of the value that they create, demand and supply are highly unstable, and distribution costs for rurally produced goods are very high. Simply put, markets often do not work very well for the poor as producers, and market volatilities and risks fully confront the poor as consumers.

But how would appropriate and timely institutional innovations come about? Initially, it was thought that institutions would improve as a consequence of individual self-interest and therefore take care of transaction costs and information asymmetries. Reality, however, has shown that the presence of coordination failure, innovation failure and authority failure are behind the failure of institutions to emerge efficiently. The high risks of production and cycles of oversupply and price depression create financial risks throughout the distribution chain that inhibit investment and access to capital. Monopolistic practices, corruption, and excessive regulations also add to the burden of the rural marketplace. The high costs, risks, and “friction” in rural agricultural markets prevents markets from achieving sufficient scale for efficiency and similarly prevent the low-cost and reliable supply of production inputs such as seed, fertilizer, and other goods to farmers. Poor farmers also lack the political power, market knowledge, and business knowledge to address these market roadblocks. Thus poor farmers lack the capacity to improve and influence the markets upon which their lives depend. But some of these capacities can be developed through effective organization, technical training, and means for assembly and communication.

It has been shown that changes in technology and the relative prices of factor endowments can induce institutional change (see Hayami and Ruttan 1971). Today, the conditions exist for inducing innovation in public research institutions. Prices of food, land, and water, have been on the rise. Political and macroeconomic stability are increasingly at risk, and have provided incentives for risk reduction. Priorities for agricultural research have started to shift, and there are calls for increasing investment in research and development. To carry this trend forward and respond to the food crisis, the theory of induced institutional innovation is a useful paradigm to consider, but induced innovations come about too slowly and this causes frictions in food systems.

Examples of successful institutional innovations include public-private partnerships, farm cooperatives, and social networks for the adoption of innovation. Farmers' transaction costs have been greatly reduced by decreasing information asymmetry through information and communication technologies. Institutional innovations have also assisted smallholders in reaching new, higher-value, markets. Public-private partnerships and organized producer groups have been successful tools for helping smallholders comply with higher food safety requirements and reduce transaction costs (see, for example, Narrod et al. 2007). A recent study in Maharashtra, India, shows not only that social networks are crucial mediators in the process of technology adoption, but also that increased involvement of women enhances collective action (Padmaja and Bantilan 2007).

Going forward, it is important that innovations include smallholders, women, and disadvantaged groups. And the rural education system is to be an essential part of the way forward with a strong role of institutional innovation, as that pathway is quite knowledge intensive. Let us be reminded of the words of Rabindranath Tagore about his ideal of "the true school in India", which he described as follows: "The school will make use of best methods in agriculture, the breeding of livestock, and development of village crafts. The teachers, students and people of the surrounding country side will be related to each other with the strong and intimate ties of livelihood." Throughout much of the developing world a new approach to rural education and extension is needed today.

IV. Policy Actions to Overcome the Crisis

The danger posed by the global financial crisis and recession is the contraction of investments needed for rural poverty reduction as cost of

capital increase and access to capital decreases. Alarming, the rich are bailed out before the poor in this crisis. To overcome the world food and agriculture crisis and assist the poor, a comprehensive set of complementary policy actions is needed: (1) promote sustainable agricultural growth, (2) reduce market volatility, and (3) expand social protection and child nutrition action. In all of these areas, science and institutional innovations are needed to complement and enhance the effectiveness of policies.

Promote sustainable agricultural growth : To enhance agricultural productivity, investments should be scaled up in the areas of R&D, rural infrastructure, rural institutions, and information monitoring and sharing. For smallholders, it is crucial to provide viable policy options and institutions to ensure improved access to finance (e.g. rural banks and microfinance), expansion of risk management (e.g. crop insurance), access to inputs (e.g. quality seeds, fertilizers, feed, veterinary drugs), access to services and extension, investment in rural infrastructure (e.g. rural roads, electrification, water and irrigation).

A recent study by IFPRI shows that if investments in public agricultural research were doubled, agricultural output would increase significantly and millions of people would emerge from poverty (von Braun, Fan, et.al. 2008). If these investments were targeted at the poor regions of the world—Sub-Saharan Africa and South Asia—overall agricultural output growth would increase by 1.1 percentage points a year and lift about 282 million people out of poverty by 2020. Not all investments, however, are equally worthwhile. International agricultural research projects with substantial payoffs for a large number of beneficiaries should be given investment priority. The “best bets” identified by the centers of the Consultative Group on International Agricultural Research (CGIAR) include innovative programs to revitalize yield growth in intensive cereal systems in Asia, increase small-scale fish production, address threatening pests like virulent wheat rust, breed maize that can be grown in drought-prone areas, and scale up biofortified food crops that are rich in micronutrients such as vitamin A, zinc, and iron. Institutional innovations such as public-private partnerships, social networks, and participatory research can greatly help in the transfer and adoption of innovations by smallholders and in adapting innovations to farmer’s needs and capacities. Rural services need to be revitalized to facilitate technology transfer, and rural borrowing is a critical component for that.

Reduce market volatility : Lack of information can lead to market inefficiencies and reduce the extent of mutually beneficial exchanges (von

Braun and Torero 2006). The spread of new information and communication technologies has significantly improved market information and welfare. Reforms and innovations are now needed in commodity markets. India should promote futures trading to minimize market risks and promote further investment in commodities. At the global level, two collective actions are needed to protect the poor, improve market efficiency, and strengthen long-term investment incentives in agriculture. First, a small physical reserve must be created to facilitate smooth emergency response. The physical reserve could be managed, for example, by the World Food Programme. Second, an international coordinated grain reserve scheme should be established, with India's participation. Third, a virtual reserve and intervention mechanism must be created to help avoid the next price spike. The organizational design of the virtual reserve would include a high-level technical commission that would intervene in futures markets and a global intelligence unit that would signal when prices head toward a spike. Usually, intervention would not be necessary, and the signaling mechanism would be sufficient to divert speculators (von Braun and Torero 2009).

Expand social protection and child nutrition action : To protect the basic nutrition of the most vulnerable and ensure food security for more of the world's population, sustainable pro-poor agricultural growth and reduced market volatility should be accompanied by social protection and child nutrition actions. Protective actions are needed to mitigate short-term risks, and preventive actions are needed to avoid long-term negative consequences. Protective interventions include conditional cash transfers, pension systems, and employment programs. Preventive health and nutrition interventions such as school feeding and programs for improved early childhood nutrition should be targeted to vulnerable groups and strengthened and expanded to ensure universal coverage. To aid the poor, these programs should go beyond social assistance and provide social development opportunities by building up physical and social assets (von Braun et al. 2005). Tying cash or food transfers to school attendance has been a successful institutional innovation in social programs. Mexico's large-scale conditional cash transfer program for poor rural households, increased the years of educational attainment by 10 percent and raised median caloric acquisition by 11 percent, among other benefits (Skoufias 2005). Bangladesh's food for education program increased school participation rates by 20–30 percent and girl's lifetime earnings by 33–35 percent (Science Council 2006). India's nutrition programs, such as the ICDS should utilize and adapt these experiences, as they are currently not achieving the desired results.

The handling of policy, technology action, and institutional change would define policy failure, policy neglect, and policy success in combating the world food and agriculture crisis. For success, R&D acceleration should be combined with a solid strategy for institutional innovation. The design of national agricultural strategies must be country-driven and country-owned, with country-specific priorities and sequencing. Given that prioritization, sequencing, transparency, and accountability are crucial for successful implementation, policy and governance practices in many countries must be strengthened. At the same time, new partners should be involved on a greater scale in policy design and implementation. The private sector and nongovernmental organizations are becoming increasingly interested in and involved.

India's rich experience can play a significant role for strategic policy change in agriculture and for food security at the international scale. In doing so, India could be a main driver of good globalization.

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Dr. Joachim von Braun

Joachim von Braun has been Director General, the International Food Policy Research Institute (IFPRI) since 2002. He guides and oversees the Institute's efforts to provide research-based sustainable solutions for ending hunger and malnutrition. Before coming to IFPRI, Dr. von Braun was director of the Center for Development Research and professor of Economics and Technological Change at the University of Bonn. He was also professor of Food Economics and Policy at Kiel University. From 2000 to 2003, Dr. von Braun served as president of the International Association of Agricultural Economists. He is an elected fellow of the American Association for the Advancement of Science, and a member of the Academy of Science of North Rhine-Westphalia and the international advisory board of the Chinese Academy of Agricultural Science. Dr. von Braun has published research on international development economics topics, including science and technology, policy issues relating to trade and aid, famine, health, and nutrition, and a wide range of agricultural economics research issues. He has worked in Sub-Saharan Africa, Central America, Egypt, Russia, and China. Dr. von Braun received his Ph.D. in agricultural economics from the University of Goettingen and holds an honorary Ph.D. from the University of Stuttgart-Hohenheim.



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Avenue II, Indian Agricultural Research Institute
New Delhi-110012

Phone: 011-65437870 Fax: 011-25843243
E-mail: taasiari@yahoo.co.in Website: www.taas.in