



Support for international agricultural research: current status and future challenges

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The success of the first Green Revolution in the form of abundant food supplies and low prices over the past two decades has diverted the world's attention from agriculture to other pressing issues. This has resulted in lower support for the agricultural research work primarily undertaken by the 15 research centers of the Consultative Group on International Agricultural Research (CGIAR). The total support in real dollars for most of the last three decades has been more or less flat although the number of centers increased from 4 to 15. However, since 2000, the funding situation has improved for the CGIAR centers, with almost all the increase coming from grants earmarked for specific research projects. Even for some centers such as the International Rice Research Institute (IRRI), the downward trend continued as late as 2006 with the budget in real dollars reaching the 1978 level of support. The recent food crisis has renewed the call for a second Green Revolution by revitalizing yield growth to feed the world in the face of growing population and a shrinking land base for agricultural use. The slowdown in yield growth because of decades of neglect in agricultural research and infrastructure development has been identified as the underlying reason for the recent food crisis. For the second Green Revolution to be successful, the CGIAR centers will have to play a complex role by expanding productivity in a sustainable manner with fewer resources. Thus, it is crucial to examine the current structure of support for the CGIAR centers and identify the challenges ahead in terms of source and end use of funds for the success of the second Green Revolution. The objective of this paper is to provide a historical perspective on the support to the CGIAR centers and to examine the current status of funding, in particular, the role of project-specific grants in rebuilding capacity of these centers. The paper will also discuss the nature of the support (unrestricted vs. project-specific grants) that will be needed for a much-desired second Green Revolution.

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Introduction

The beginning of organized, post-colonial international agricultural research programs can be traced back to the early 1940s when the Rockefeller Foundation collaborated with the Mexican government to increase the production of wheat, maize and beans. In the mid-1940s, Mexico imported nearly half of its wheat for consumption. Within a short span of ten years, the pilot program led by Dr. Norman Borlaug developed high-yielding semi-dwarf wheat varieties that enabled Mexico to achieve self-sufficiency. This marked the beginning of the so-called “Green Revolution”. By 1963, 95% of Mexican wheat area was under the new semi-dwarf varieties, with yield six times higher than in 1944. Eventually, the Mexican wheat program grew into the International Maize and Wheat Improvement Center (CIMMYT) in 1963, with the support of the government of Mexico and the Rockefeller Foundation to extend this program to other countries.

Despite this rousing success in Mexico, most of Asia and Africa in the 1950s and 1960s faced acute food shortages and struggled to feed its rapidly expanding population because of frequent famine and drought. According to the FAOSTAT database, per capita grain production in Asia was 194 kg in 1961 compared with 868 kg for the U.S. This is reflected in the nutritional status of the population, with per capita calorie intake of 1891 kcal per day for Asia compared with 2882 kcal for the U.S. During this period, life expectancy in most Asian countries was less than 50 years and infant mortality was unbelievably high, at 125–150 deaths per 1000 births. The situation in Africa then was better than in Asia, where per capita calorie intake was 2089 kcal per day and infant mortality was 100–300 deaths per 1000 births.

Faced with an uncertain food situation, the Indian government invited Dr. Borlaug in the early 1960s to repeat the success with Mexican wheat. Soon after, the government introduced high-yielding wheat varieties in the northwestern state of Punjab with the help of Dr. Borlaug and the Ford Foundation. From India, Dr. Borlaug introduced semi-dwarf wheat varieties into Pakistan. Attempting to replicate the success of wheat in rice, the Ford and Rockefeller Foundations established the International Rice Research Institute (IRRI) in the Philippines in 1960 with the objective of developing high-yielding rice seeds for Asia.

The release of high-yielding semi-dwarf variety IR8 by IRRI in the late 1960s and the dissemination of high-yielding wheat varieties in India and Pakistan marked the beginning of the Green Revolution in Asia. This modern high-yielding variety was developed with the objective of increasing yield in response to applications of fertilizers, and reliable irrigation. By 1980, high-yielding wheat and rice varieties covered large area on the Indian subcontinent. Such rapid adoption was possible because of active support from the government in the form of guaranteed support prices, free irrigation, and heavily subsidized inputs.

The grand success of modern wheat and rice varieties in Latin America and Asia in the 1960s led to the creation of the CGIAR (Consultative Group on International Agricultural Research) in 1971 to coordinate and spread the benefits of agricultural research globally. The World Bank led the efforts to create the CGIAR with active sponsorship of the FAO (Food and Agriculture Organization) and UNDP (United Nations Development Program). Apart from IRRI and CIMMYT, the group also included two additional centers, established by the foundations in the 1960s, CIAT (Inter-

national Center for Tropical Agriculture in Colombia) and IITA (International Institute of Tropical Agriculture in Nigeria). Over the years, the group expanded to include 11 additional centers to widen the scope of international agricultural research to cover other food crops, livestock, fish, water management, agroforestry, and policy research. The establishment of these centers led to the development of high-yielding varieties of sorghum, millet, maize, root crops, and pulses.

The Green Revolution and its impacts

Before the beginning of the Green Revolution in the late 1960s, Indian paddy yield was static at 1.5–1.6 tons per hectare. Since then, more than 1000 modern varieties have been released to farmers, resulting in a rapid increase in global rice production, with half of these varieties developed at IRRI and by its partners (IRRI 2004) [1]. By 1980, Indian paddy yield reached 2 t/ha (FAO-STAT) [2]. Yield increased further by another 30% to 2.6 t/ha by 1990. By 2000, paddy yield was hovering around 3 t/ha. Shorter duration of the high-yielding varieties also allowed farmers to harvest a second crop. For example, IR36, developed by crossing IR8 with other varieties, matured in 105 days compared with 130 days for IR8 and 170 days for traditional varieties.

With the expansion of both area and yield, Indian rice production during these three decades more than doubled from 60 million tons in 1970 to around 135 million tons in 2000 (FAO-STAT). The modern high-yielding rice varieties were also adopted across other Asian rice-producing countries in the 1970s. In the Philippines, rice production nearly doubled two decades after the introduction of IR8. The Green Revolution also had a similar impact in other Southeast Asian countries, with the doubling of paddy production from 63 million tons in 1970 to 126 million tons in 1994 (FAO-STAT). Indonesia changed from a food-deficit country in the 1960s to a food self-sufficient country in 1984. Similarly, Vietnam became a food-surplus country in the mid-1980s from being a food-deficit country in the 1960s.

The introduction of semi-dwarf varieties also increased South Asian wheat production, with Indian production rising from 12 million tons in 1965 to 66 million tons in 1995, more than a fivefold increase in three decades (FAO-STAT). Over the four decades, more than 3000 modern wheat varieties have been released to farmers to sustain the production growth that began in the early 1960s [3].

Overall, cereal production in Asia during the last four decades of the Green Revolution era increased from 385 million tons in 1965 to more than a billion ton in 2005 (FAO-STAT). This has been possible due to the rapid adoption of high-yielding varieties in developing countries from 20% for wheat and 30% for rice in 1970 to about 70% for both crops in 1990 (IFPRI, 2002). Even with more than doubling of the Asian population during this period, the increase in cereal production has been able to more than offset population growth, with *per capita* cereal production rising from 207 kg in 1965 to 275 kg in 2005. In line with rising cereal consumption, *per capita* calorie intake also increased by more than 40% from 1891 in 1960 to 2695 in 2003. Similarly, life expectancy and infant mortality also witnessed significant improvements during the post-Green Revolution era. The undernourished population also declined all across Asian regions with East and South-east Asia witnessing the maximum drop from 43% in 1969–1971 to

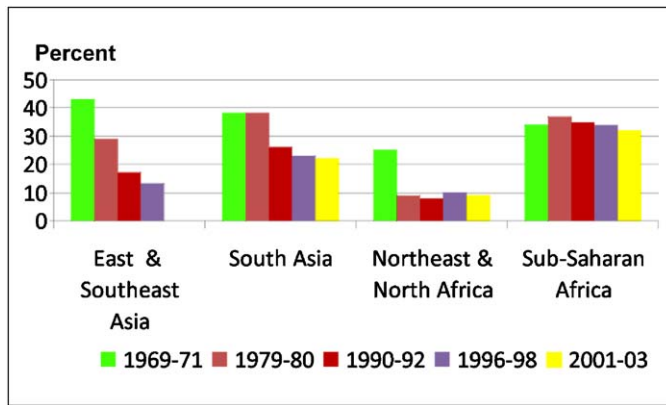


FIGURE 1

Percentage of people undernourished in developing regions. Source: Food and Agriculture Organization.

13% in 1996–1998 and South Asia from 38% to 23% during the same period (Fig. 1). Unlike Asia, sub-Saharan Africa during this period hardly witnessed any decline in undernourished population.

In a recent study conducted by the Special Project on Impact Assessment (SPIA) of the CGIAR's Technical Advisory Committee, the impact of the Green Revolution was estimated using the International Food Policy Research Institute's multi-market commodity model (IMPACT). The simulations suggested that crop yields in developing countries would have been 19.5–23% lower without the Green Revolution and crop prices would have been constant in real terms rather than a 40% decline between 1965 and 2000 [4]. Lower production would have resulted in higher crop prices, with 30–65% higher than the actual prices. Lower food consumption would have reduced *per capita* calorie intake by 13.3–14.4% and would have increased malnourished children by 6.1–7.9%. In addition, infant mortality would have been much higher in developing countries without the Green Revolution.

Contributions to overall economic growth

The increase in per capita cereal production resulted in a decline in cereal prices during the Green Revolution era. As shown in Fig. 2, a steady increase in *per capita* rice production in the 1970s, 1980s, and the first half of the 1990s resulted in a steady decline in real rice prices. A similar trend is seen for wheat and maize. During this period, lower food prices kept the wage rate low, contributing to faster overall growth of the Asian economy. The transformation of Asian countries from food deficit to self-sufficiency enabled them to use foreign exchange for infrastructure and other development activities rather than using it for food imports. Apart from the direct contribution to overall economic growth, agricultural development also played an important role in augmenting development in the rest of the economy [5,6].

A study by Hazell and Ramasamy [7] surveyed 11 villages in Tamil Nadu in the beginning of the Green Revolution and again in the early 1980s. The study concluded that every rupee generated in increased sales of agricultural output created 1.87 rupees of activities in the non-agricultural sector, with about half in demand for inputs, marketing, and processing of crops, and half in meeting consumer demand. In addition, growth in the agricultural sector during the Green Revolution has been instrumental in freeing

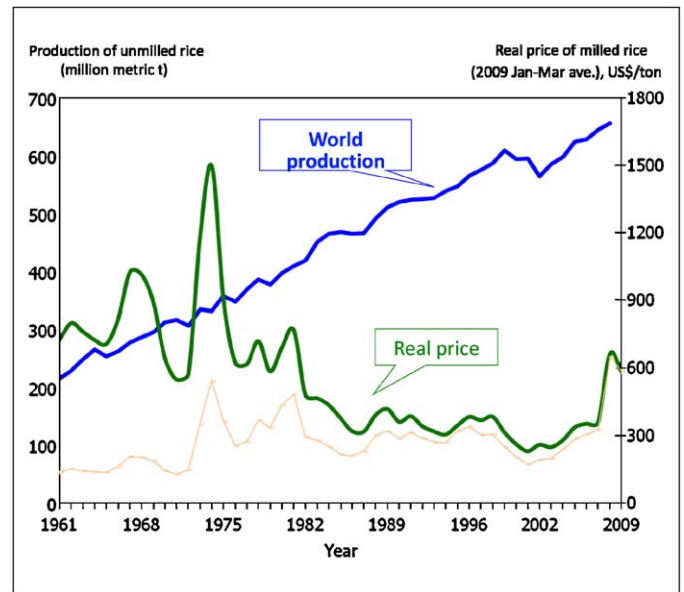


FIGURE 2

Trends in world rice production and price, 1961–2009. Source: Production: USDA, Mar 2009. Rice price: Relate to Thai rice 5%-broken deflated by G-5 MUV Index deflator (adjusted based on 28 January 2009 data update). Source of raw data: www.worldbank.org.

millions from poverty over the past 40 years. The absolute numbers of poor people fell from 1.15 billion in 1975 to 825 million in 1995 despite a 60% increase in population, and most of the decline was attributable to agricultural growth and the corresponding decline in food prices [8]. The number of undernourished in Asian countries also declined significantly in the last four decades.

Not so good effects of the Green Revolution

Despite resounding success in expanding food production and improving the lives of billions of poor people, the Green Revolution has been criticized on several grounds. The first and foremost is the environmental and land degradation caused by the excessive use of fertilizers, pesticides, and irrigation water. This contributed to the pollution of groundwater and other waterways, weakened the natural protection system by killing beneficial insects and other wildlife, and affected the health of farmers [8]. The critics of the Green Revolution have also mentioned genetic erosion because of the wide-scale cultivation of fewer varieties of high-yielding crops.

Fertilizer use in Asian countries increased markedly in the last four decades. It is noteworthy to point out that IRRI survey data estimate Chinese per hectare NPK use on irrigated rice farms in China at 256 kg in 2004 compared with 173 kg in Vietnam, 167 kg in Indonesia, and 95 kg for India. Although 95 kg of NPK in India sounds low, the variations among Indian states are still very large. The problem is much more severe in the frontline Green Revolution states of Punjab and Haryana, where per hectare NPK use is 200 kg/ha compared with 50 kg/ha for Orissa and 10 kg/ha for Arunachal Pradesh, the states mostly left behind by the Green Revolution. Similarly, irrigation water use has also increased in many Asian countries, more notably in India, where water withdrawal for agriculture increased by more than 70% in the last three decades (Fig. 3). In a recent study published in *Nature*, Rodell *et al.* [9] concluded that

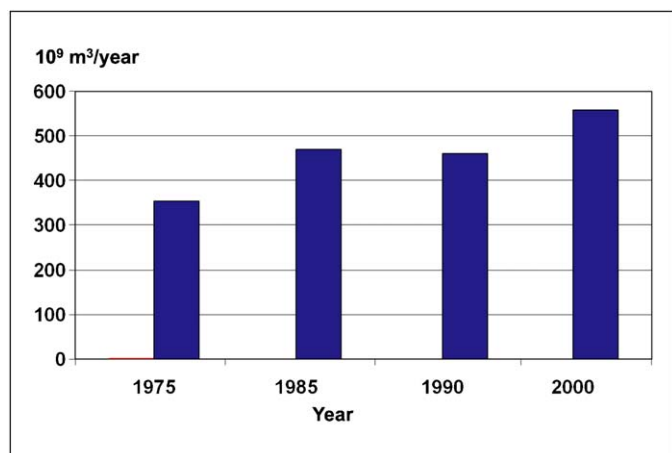


FIGURE 3

Indian agricultural water withdrawal. Source: FAO AQUASTAT database.

groundwater use for irrigation in northwestern India is not sustainable. According to this study, the water table over this part of India is declining by 4 cm per year.

On the socioeconomic front, it has also been argued that the Green Revolution catered to resource-abundant regions and left behind resource-scarce regions that needed the most support. Sub-Saharan Africa and eastern India are some of the regions where the Green Revolution did not have much impact although poverty density in these regions is probably one of the highest in the world. Paddy yield in eastern India and sub-Saharan Africa throughout the Green Revolution era from the 1960s to late 1980s was stagnant at around 1.5 t/ha (Fig. 4). Yield growth in eastern India revived in the last two decades with renewed attempts by the government to have a reliable supply of quality seeds, fertilizer, pesticide, plant protection equipment, and some improvement in irrigation. But the yield growth in sub-Saharan Africa remains extremely low even in recent decades. Over the years, many attempts have been made to introduce improved varieties but none has been very effective so far. Even NERICA rice, which

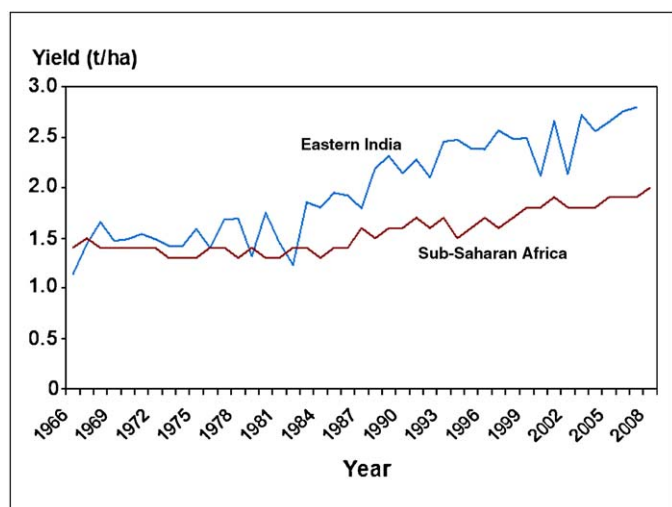


FIGURE 4

Paddy yields in sub-Saharan Africa and eastern India. Source of basic data: World Rice Statistics and USDA 2009.

was initially thought to be a miracle rice for Africa, is yet to have a significant impact 15 years after its development. The failure of the Green Revolution in resource-scarce regions has made some even go to the extent of pointing out that the Green Revolution was custom-made for wealthy farmers and widened the gap between rich and poor farmers by making the rich richer. However, these farmers were poor before the Green Revolution.

Making the Green Revolution sustainable

After achieving much-needed food production growth by introducing high-yielding varieties, agricultural scientists have been working tirelessly to provide solutions to problems that have come to the forefront since the onset of the Green Revolution. Some examples are improved crop management practices such as integrated pest management (IPM), site-specific nutrient management, and water-saving irrigation technologies to sustain productivity growth. The focus has also shifted to improving productivity in unfavorable environments by developing stress-tolerant varieties.

The rice varieties developed for salt tolerance through collaborative research at IRRI and in other national rice research centers are already increasing the productivity of salt-affected areas. Similarly, the recent introduction of Sub1 or flood-tolerant modern varieties in India and Bangladesh, where around 7 million hectares of rice land are prone to flash flooding, allows the rice plant to survive up to 2 weeks under water. This is long enough to completely destroy traditional non-submergence-tolerant modern varieties. According to IRRI estimates, these Sub1 varieties have the potential to increase production by up to 4 million tons in India and Bangladesh. These varieties are being introduced in many Southeast Asian countries this year for field trials. In total, these Sub1 varieties can work as protection against flash flood for up to 2 weeks on 20 million hectares of flood-prone rice area in South and Southeast Asia.

In 2002, severe drought in rainfed rice-growing regions in India lowered rice production by 21 million tons, accounting for 80% of the world decline in rice production. IRRI recently developed the first drought-tolerant variety (IR74371-70-1-1) and a few other drought-tolerant varieties are in the pipeline at different stages of development and field trials. According to Dr. A. Kumar from IRRI, the recommended line maintains the same yield as that of current varieties in normal rainfall years and provides a yield advantage of 0.8–1.0 t/ha under severe drought stress. If successfully disseminated, the drought-tolerant varieties could have an even bigger impact on production than the submergence- or salt-tolerant varieties. Drought is also a major stumbling block in expanding maize production in Africa, a staple food for a majority of the people on that continent. On average, maize yield declines by at least 15% because of drought [10]. IITA, CIMMYT and various national partners have worked together over the years in developing drought-tolerant varieties for sub-Saharan Africa. More than 50 drought-tolerant maize varieties have been released for dissemination to the private sector and national partners and other non-government organizations in recent years. These varieties are expected to produce 20–50% more than other traditional varieties under drought.

Apart from expanding production in both favorable and unfavorable growing conditions, new research efforts are seeking to

improve the nutritional content of grain to alleviate micronutrient deficiency of millions of poor people around the world. Despite the documented success of the Green Revolution in expanding food production, malnutrition in many parts of the developing world (Fig. 2) remains unexpectedly high, especially in sub-Saharan Africa (SSA) and South Asia (SA). To alleviate malnutrition, scientists have developed vitamin A-rich rice called “Golden Rice” to help overcome vitamin A deficiency in 3 million children in developing countries. Golden Rice is a genetically modified variety of rice that contains beta-carotene, a vitamin A precursor. A recent study conducted by Tang *et al.* [11] found that four units of beta-carotene from Golden Rice contain 35 µg of beta-carotene per gm, which converts to one unit of vitamin A in humans. Scientists at IRRI are also working to develop rice with high iron and zinc concentrations. (See article by I. Potrykus, Lessons from the “Humanitarian Golden Rice” project, this volume.)

Declining support for agricultural research

The great early success of the Green Revolution in the form of abundant food supplies and low prices has also been its worst enemy in turning attention away from agriculture. This developed complacency among policy makers that the war against hunger had been won and this resulted in a diversion of resources from agriculture to other pressing needs in the last two decades. This is clearly evident from the spiralling downward of agricultural research and infrastructure development loans by international financial institutions such as the World Bank and Asian Development Bank (ADB). As Fig. 5 shows, World Bank lending for agriculture steadily declined to close to US\$1 billion in 2008 since reaching its peak of \$6 billion in 1987. A similar trend is evident in Asian Development Bank (ADB) lending for agriculture, whose share in total lending declined from more than 40% in 1986 to less than 2% in 2007 (Fig. 6). Both ADB and the World Bank have also reduced their lending for agricultural research in recent years. For example, the World Bank’s lending for agricultural research declined from its peak of around \$400 million in 1998 to less than \$100 million in 2007 (Fig. 7).

The growth of investment in public-sector agricultural research and development also declined over time from 6% in the 1970s to

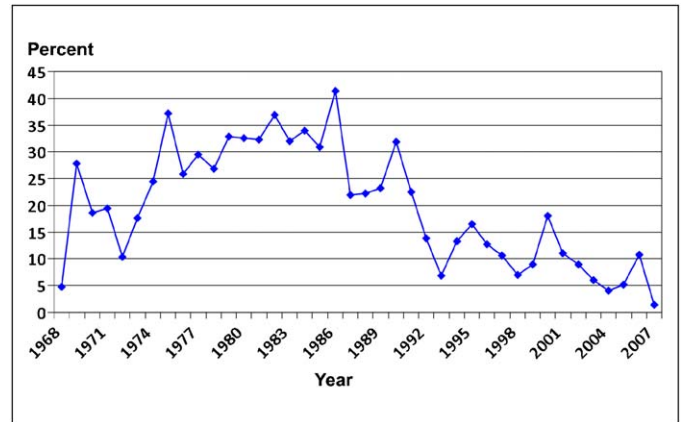


FIGURE 6 Share of agriculture in ADB’s total lending. Source: ADB Annual Reports and other sources.

4% in the 1990s for Asia, from 10% to 2% in Latin America, and from 2% to 1% for Africa [12]. For developed countries, public-sector investment in agricultural research and development during the same period declined from slightly above 2% to negative growth in recent years.

The overall decline in support for agricultural research and development has also resulted in lower support for international agricultural research primarily undertaken by the 15 research centers of the CGIAR. Fig. 8 shows the trend in CGIAR funding over the last 50 years. After a steady increase in support for the CGIAR centers in the initial years, the total support in real dollars has been more or less flat for the remaining period although the number of centers increased from 4 to 15. Under this scenario, one would expect a significant decline in support at the center level and this is evident in the funding trend at IRRI (Fig. 9), where the total budget in real dollars declined from \$63.7 million in 1993 to \$28.7 million in 2006, a decline of more than 50%. A similar trend has been witnessed for most centers in the CGIAR system during the last two decades.

The impact of the decline in support of agricultural research and development has started to show up in a slowdown in productivity

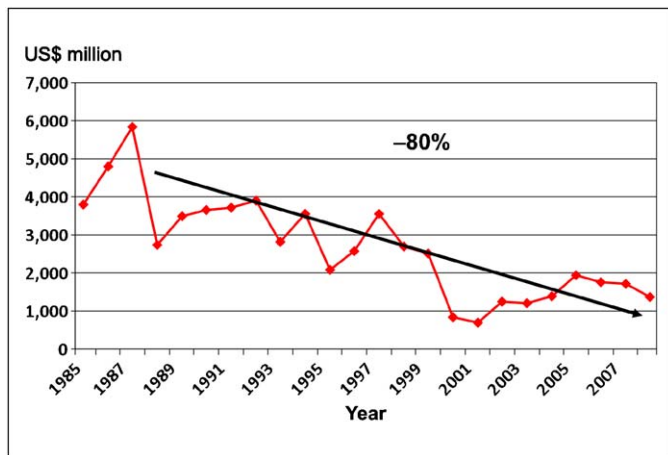


FIGURE 5 World Bank lending for agriculture. Source: World Bank Annual Reports and various other online sources.

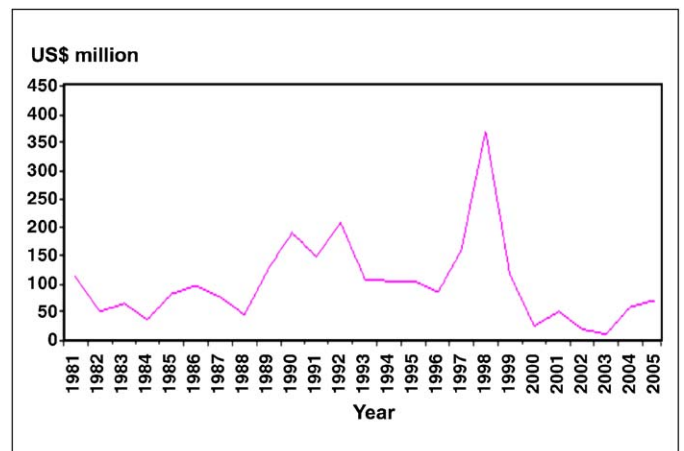


FIGURE 7 World Bank lending for agricultural research. Source: The World Bank.

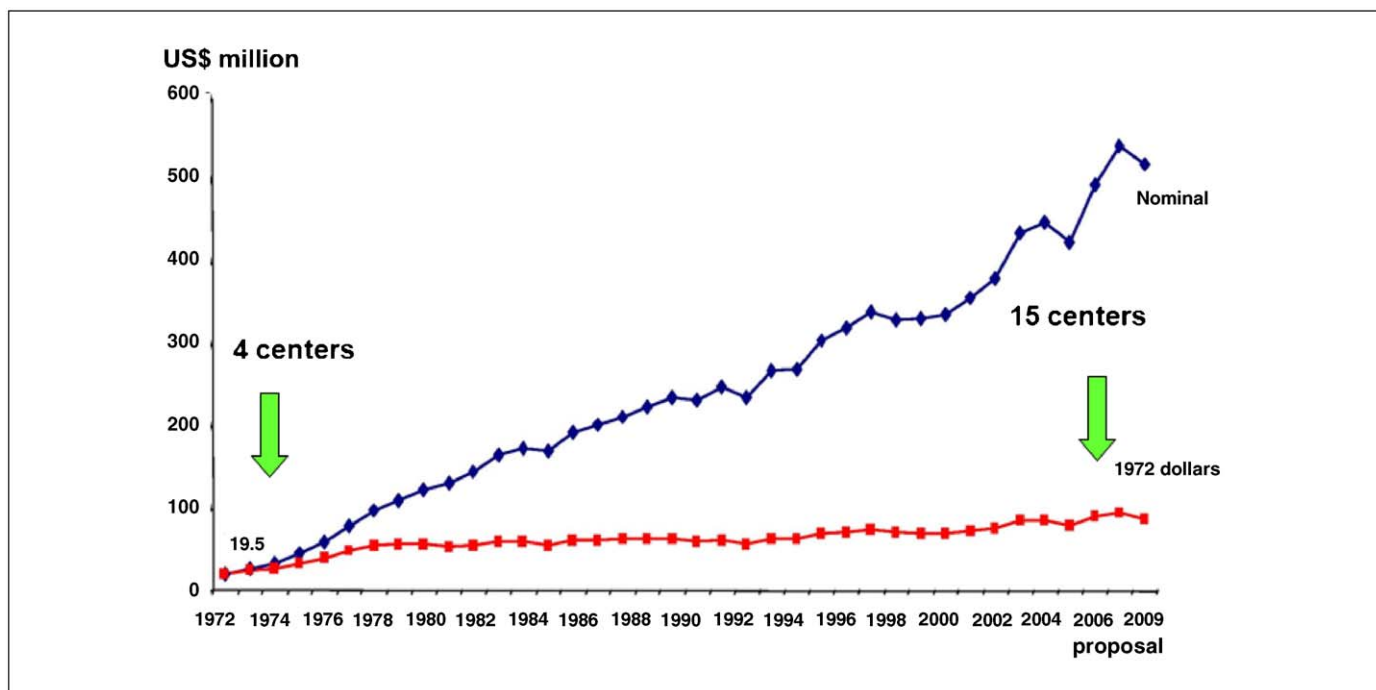


FIGURE 8

CGIAR funding trends in nominal and 1972 dollars. Consultative Group on International Agricultural Research

growth of cereal crops. Yield growth of the two major food crops (rice and wheat) declined to less than 1% in the recent years compared with more than 2% during the first two decades of the Green Revolution period. For maize, the decline in yield growth during the same period does not appear to be that drastic because of the adoption of genetically modified maize in most maize-growing countries, including the United States, Argentina and Brazil. Among the three grains, the slowdown in rice is the highest although production has been increasing at a higher rate because of additional rice area.

The slowdown in productivity growth combined with increasing demand arising out of economic development and population growth in developing countries and biofuel expansion in devel-

oped countries has resulted in a drawing down of cereal stocks in the recent years. In the last eight years, global stocks for rice, wheat and maize declined by around 40% from 546 million tons in 2000 to 331 million tons in 2008 [13]. For rice, the drawing down of stocks since 2001 to meet the deficit has resulted in a steady increase in rice prices during this period. From 2001 to 2007, rice prices nearly doubled primarily, because of supply-demand imbalances.

Thus, even before the recent rice price spike, the market was primed for such a mishap with stocks hovering around a level not witnessed in decades. Rising wheat prices due to drought in Australia, and the expansion of biofuel crops put pressure on rice, which led to trade restrictions in many rice-producing countries and unprecedented rises in prices. During a span of six months, from November 2007 to May 2008, rice prices nearly tripled in the international market. As expected, rice prices have declined after reaching an all-time high in May 2008 but they still remain high relative to a few years ago.

Global grain consumption remains strong, driven by both population and economic growth in many Asian and African countries. FAO projects that cereal demand will grow by 50% by 2050 (Fig. 10). Specifically for rice, Mohanty [14] estimates that rice consumption will grow by 60 million tons of milled rice or 90 million tons of rough rice by 2020. The study estimates that overall per capita rice consumption will decline slightly from 64 kg in 2007 to 63.2 kg in 2020, with declining per capita consumption in some countries (China, Thailand, South Korea, Japan, and Taiwan) more or less offset by rising per capita consumption in others. The projected future demand for cereals may even go higher than the projected level depending on the extent of ongoing economic downturns and the price of other food items (livestock products, fruits, and vegetables).

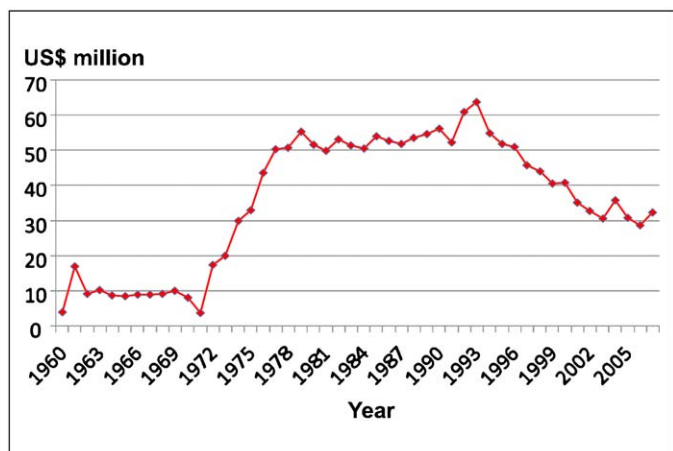


FIGURE 9

IRRI budget, 1960–2007 (US\$2007).

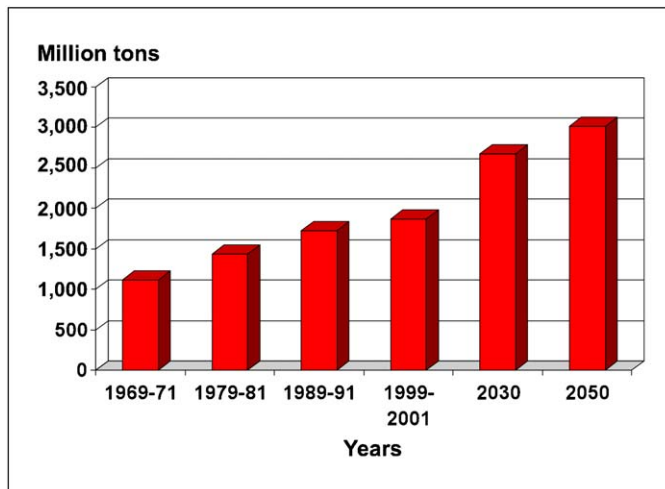


FIGURE 10

2050 world cereal demand projections. Source: Food and Agriculture Organization.

Although things have calmed down on the supply side because of record production in many rice- and wheat-growing countries, uncertainties are huge regarding the source of future growth in global grain production. This is particularly true for rice, for which the recent crisis has exposed the fundamental imbalance between supply and demand. Over the past 8 years, nearly half of the production increase has been attributed to area expansion rather than productivity growth [15]. Current rice area is at a historic high and yield growth has fallen below 1%. At the same time, global rice consumption has been rising at a healthy 1.55% annually. As indicated earlier, production growth of 1.2–1.5% will be needed in the medium term to keep rice affordable to millions of poor people [15].

Refocusing on agricultural research and development

Realizing the need for faster production growth, there has been a call from all quarters for a second Green Revolution. Nobody really questions the need to revitalize yield growth for achieving global food security; however, there are differences on how to go about achieving this objective in the face of several 21st-century constraints, including land and water scarcity, environmental degradation, and high input prices and higher incidence of extreme weather. Irrespective of how we go about achieving a second Green Revolution, the international agricultural research centers will have to play a pivotal role in making this a reality, that is, raising productivity with few resources and in a sustainable manner.

Successful realization of another Green Revolution definitely hinges on CGIAR research centers and how quickly they can retool themselves and develop products that can withstand climate change and protect the environment. A recent study by the International Food Policy Research Institute (IFPRI) estimates that rising temperature and increasing weather variability are likely to have their greatest effect in many parts of Asia. South Asia is estimated to bear the brunt of the impact as many areas become unsuitable for crop production and, without any intervention, the region is estimated to be a significant food-deficit region.

As already established by researchers from IFPRI and the University of Minnesota, there is a 10–15-year lag between agricultural

research spending and its impact on productivity. What we witness now is an outcome of our action toward agriculture in the last two decades in neglecting agricultural research and development support. If we start reinvesting now, the effects are likely to be evident somewhere around 2025. Before it is too late, the world should start reinvesting in agricultural research and use all tools at its disposal, including using agricultural biotechnology to improve global food security.

However, the infrastructure and core scientific capacity of these centers have been eroded because of declining financial support. The financial situations in most international research centers have begun to reverse in the last few years, primarily through support from non-traditional donors. After years of downward spiraling of research support, these centers are beginning to regroup and rebuild their infrastructure and the scientific capacity they once possessed. But, it is important to realize that most of the increase in funding to these centers is special projects, known as “restricted support”, and this is expected to be used for achieving objectives and milestones explicitly identified in the projects. This is very different from the early days when the centers were receiving funding without any strings attached, known as “unrestricted support”, which was spent for achieving the institute’s core research activities. In the case of IRRI, unrestricted support accounted for 50% of the total budget in 1997 compared with less than 20% today. Even in absolute terms, restricted support during this period has declined from \$18.3 million in 1997 to less than \$12 million in 2009. This is happening at a time when IRRI’s total support has increased substantially from \$36 to \$60 million.

Things are definitely better now than a few years ago. The rise in restricted funding has definitely come at an opportune time to keep many international agricultural research centers afloat at least for the time being. But it is important to note that restricted funding may not produce products that have global applicability as is the case with unrestricted funding. In addition, it is becoming increasingly difficult for the centers to focus and implement their strategic plan when attention is diverted toward achieving success with special project grants. In response to the third ICRAF (International Center for Research in Agro-Forestry) External Program and Management Review report, the Science Council of the CGIAR in 2007 [16] advised that the center needed to learn to manage its restricted funding in a way that contributed to its strategic goals. In their recommendations, the Council advised the center to be selective in calling for support. In addition, the Council suggested a strict implementation of full cost recovery of sponsored projects. This is definitely something new for most centers because, during the days of unrestricted funding, special projects accounted for a very small share of total funding and had normally been subsidized. But, in the current environment in which sponsored projects account for the majority of funding, business as usual is no longer an option.

One can argue that the rise in restricted support also increases unrestricted funding through overhead charges and should support the activities for pursuing strategic goals. But the truth is that overhead charges of the CG centers, which range from 10% to 20% vis-à-vis 40–50% in most U.S. universities, are not enough to cover all project-related costs, including fixed costs, incurred by a center. One option is to go the U.S. universities’ route and raise the overhead to 50%. A second option is to keep the overhead as is

and put in place a system that can recover most of the project-related costs incurred by a center. It appears that donors are more receptive to the second option than the first one, in which they cannot tract 50% of the total funds up front.

Concluding remarks

International agricultural research has definitely played a key role in the last 50 years in expanding food production to offset the ever-expanding population growth in many food-deficit countries around the world. This has improved the nutritional intake of billions and has reduced child mortality and undernourishment of infants around the developing world. The benefits of a vibrant agricultural sector have also supported overall economic growth in many Asian countries over the years. The economic boom witnessed by developing Asia in the last two decades can be easily linked to cheap food during this period. But things are not the same anymore

and negligence in this sector is reflected in the slowdown in productivity growth. The recent food crisis is an example of what the future will look like if we do not intervene and reinvest in agricultural research and development. Unlike the first Green Revolution, this will be much more complex because of our dwindling resource base, more severe environmental problems, and climate change.

In this complex world, CGIAR research centers will have to play a key role in making another Green Revolution a reality. Although support for these centers started to turn around in the last few years, the support now is quite different from what it used to be. For CGIAR centers to contribute effectively to a second Green Revolution, two things need to happen. First and foremost, the world should turn its attention to agriculture and support agricultural research and development. Second, the centers should focus on producing global public goods regardless of the restricted/unrestricted funding balance.

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