TRIBUTE

The Post-Conflict Reconstruction of Cambodia's Rice Economy[1]

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Introduction

> I still recall the fear in the faces of the Kampuchean research scholars and scientists who came to IRRI for training in 1986, when my wife and I invited them to dinner at our home on the day of their arrival. When they returned after a few months of stay and training at IRRI they were indeed totally transformed human beings. It was a pleasure to watch the elimination of fear and the instillation of self-confidence and pride in them.
>
> M. S. Swaminathan (2004)

In a foreword to Don Puckridge's *The Burning of the Rice: A Cambodian Success Story* (Puckridge 2004), Professor M. S. Swaminathan was referring above to the first group of 13 trainees who came to the International Rice Research Institute (IRRI) from the then People's Republic of Kampuchea (PRK), the state of Cambodia from 1979 to 1989. At a time when few countries outside the Soviet Bloc and India recognized the PRK, IRRI used its stature in the Philippines and funding from the Government of Australia to enable these Cambodian trainees to spend five months at IRRI headquarters learning modern rice production techniques and developing their English language capabilities. Improving local capacity was the cornerstone of reconstructing Cambodia's rice economy after the damage and disruption caused by more than a decade of conflict.

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[1] This article is excerpted from "Universal Food Security; How to End Hunger While Protecting the Planet". An earlier extended version of the paper was published in *Current Science* on the occasion of Professor M. S. Swaminathan's 90th birthday (see Denning 2015).

Historical Context

In the twentieth century, few countries experienced the levels of social disruption, human carnage, and physical destruction that befell Cambodia. As the Vietnam War spilled across the border, the country was bombed relentlessly between 1969 and 1973 (Shawcross 1979). During that period, the U.S. military dropped an estimated half a million tonnes of munitions on Cambodia (Owen and Kiernan 2015). Despite this extreme use of force, on 17 April 1975, the capital city, Phnom Penh, fell to forces of the Communist Party of Kampuchea, known widely as the Khmer Rouge. In the preceding five years, the population of Phnom Penh had doubled to two million as the rural population fled the bombing and the advance of the rebel forces (Russell 1987).

Within weeks of overthrowing the Lon Nol government, the Khmer Rouge emptied the capital and other cities, relocating the population to all parts of the country, separating families, and creating organised labour and production brigades. Recognising the symbolism of empowering rural people, the Khmer Rouge leader, Pol Pot, immediately placed a high priority on increasing rice production. He established an ambitious national target of 3 tonnes/ha that was likely to have been modelled on a similar campaign instituted in China by Hua Guofeng (Chandler 1999). As early as May 1975, Radio Phnom Penh pronounced: "If we have rice, we have everything" (Chandler 1999). Although Cambodia was a significant rice exporter during the 1960s, average national yields were in the range of 1.0 to 1.4 tonnes/ha, the lowest in Asia.[2]. To more than double rice production without external inputs like fertilizer and well-adapted seeds would be a formidable and ultimately an unrealistic task.

Between 1975 and 1978, the Khmer Rouge instituted some extraordinarily draconian and ill-conceived agricultural policies. Within the context of a four-year plan to build socialism in agriculture and other sectors and to achieve the 3 tonnes/ha target, the government moved to replace Cambodia's traditional rainfed rice with high-yielding irrigated rice systems that would, in principle, rapidly increase production. Irrigation canals were constructed on 1 km^2 grids by deploying forced laborers, many of whom were relocated from Phnom Penh and other cities. Within these irrigation grids, one-hectare plots were designed from existing parcels and farmed by communal production groups. The infrastructure, however, was poorly designed and hastily constructed without consideration of water requirements and stream capacities and flows. This caused flooding and required frequent major repairs. Throughout the Khmer Rouge period, production stagnated at around 1 tonne/ha, and the country plunged into deep food deficits and widespread starvation. The Khmer Rouge rejected what they considered to be modern technology, as illustrated by the following quote attributed to a Khmer Rouge leader

[2] See FAOSTAT, http://www.fao.org/faostat/en/#data/QCL.

when emphasizing the overriding importance of their unique brand of Cambodia's socialist revolutionary movement: "Technology is not the decisive factor; the determining factors of a revolution are politics, revolutionary people, and revolutionary methods" (Himmel 2007).

Under the Khmer Rouge leadership, the country, then called Democratic Kampuchea, experienced almost four years of genocide and crimes against humanity, while launching periodic attacks against Thailand and Vietnam. While estimates vary, noted Yale University expert on the Cambodia genocide, Ben Kiernan, assesses that the Khmer Rouge was responsible for the deaths of about 1.7 million people, an extraordinary 21 percent of the population (Kiernan 2004).

In December 1978, Vietnam invaded Cambodia, and by January 1979, it had removed the Khmer Rouge leadership from Phnom Penh. Several years of slow recovery followed, supported by the governments of Vietnam, the Soviet Union, Eastern European Soviet-bloc nations, Cuba, India, and several nongovernmental organizations (NGOs). Because of Vietnam's role in the overthrow of the government, the United Nations — in particular, China, the United States, and the United Kingdom — refused to recognize the new Vietnam-supported regime, known as the People's Republic of Kampuchea. For more than a decade, civil war continued, and Cambodia remained internationally isolated by an official UN doctrine that rejected nondemocratic regime change, despite the clear, albeit delayed, acknowledgment of the genocidal actions of the Khmer Rouge.

IRRI in Cambodia

It was within this complex, bloody, and tragic historical setting that, in 1985, IRRI director general Professor M. S. Swaminathan initiated a programme of international cooperation with Cambodia that would serve as the country's primary source of scientific and technical support to the agriculture sector for more than 15 years. With his deep knowledge of Indian agricultural research as a scientist and administrator, Swaminathan appreciated the necessity of a strong national research infrastructure. He argued that "only a strong national research system could take advantage of advances in international research" and pointed to the ease with which India embraced and deployed new wheat and rice varieties that launched his country's green revolution (Rao 2013).

After several months of exchanging letters and telexes, and following a visit to IRRI by two Cambodian agricultural officials, the then agriculture minister and deputy prime minister, Kong Sam Ol, formally approved a mission to Cambodia by a team of three IRRI scientists (Puckridge 2004). With arrangements made by the UN Children's Fund (UNICEF), one of the few international organizations allowed to operate in Phnom Penh, IRRI's first postwar mission to Cambodia took place from January 23 to 30, 1986. The group comprised Dr. Gurdev Khush (renowned IRRI rice

breeder and World Food Prize laureate in 1996), Dr. Don Puckridge (IRRI agronomist and representative in Thailand), and the author.

Mobilising funds to support the IRRI–Cambodia programme presented unusual challenges. The lack of diplomatic recognition of Cambodia, outside the Soviet-bloc countries and India, made IRRI's traditional donors reluctant to contribute. However, Swaminathan approached the government of Australia, recognising its geopolitical interests in the region. Through a series of discreet meetings and correspondence with Australian officials in Canberra and Manila, including a ten-minute discussion between Swaminathan and Prime Minister Bob Hawke during the latter's visit to Manila in May 1986 (Rao 2013), agreement was reached to establish the IRRI–Indochina Programme, which would include Cambodia, Viet Nam, and the Lao People's Democratic Republic (Lao PDR, also known as Laos). Later this programme would become more transparently the Cambodia–IRRI–Australia Project (CIAP), while separate country-focussed projects continued in Viet Nam and Lao PDR. Between 1987 and 2001 Australia contributed almost US$25 million to support Cambodia through CIAP (Nesbitt 2002).

The first decade of IRRI's programme of research cooperation in Cambodia was comprehensively documented in CIAP project leader Harry Nesbitt's *Rice Production in Cambodia* (Nesbitt 1997). This volume highlighted some of the unique challenges encountered in improving production in a country dominated by diverse, rainfed rice ecosystems. Most of Cambodia's farmers were clearly part of IRRI's "other three": those three-quarters of rice farmers who subsisted in the harshest production environments. Major areas of emphasis included rice varietal improvement, soil fertility management, farming systems research, integrated pest management, mechanization, and postharvest improvement (Nesbitt 2002). Don Puckridge published a richly detailed, anecdotal history of IRRI's Cambodia programme, titled *The Burning of the Rice* (Puckridge 2004).

Under Swaminathan's guidance, IRRI's collaborative programme in Cambodia embraced the importance of local ownership and leadership as the foundation of sustainable capacity development. To that end, two critical programmatic priorities were established at a very early stage: a massive training of Cambodian agricultural scientists and practitioners, and the establishment of a national research institute to be known as the Cambodian Agricultural Research and Development Institute (CARDI).

The report of IRRI's first mission in January 1986 noted that the biggest constraint facing the country was the shortage of trained human resources and that local capacity development should be given the highest priority (Khush *et al.* 1986). The team noted that only 20 of the 300 graduates of the prewar University of Agriculture remained in the country; the rest had died or had fled. Later, Nesbitt estimated that only 40 of the 400 qualified agriculturalists remained in Cambodia immediately after

the war. Through a variety of capacity-building opportunities, which included in-country training, international courses at IRRI and elsewhere in the region, and master's and PhD programmes in several countries, Cambodia was able to rapidly build its capacity in rice research and extension. By 2001, a total of 1,700 Cambodians had been trained with IRRI's support (Nesbitt 2002).

The IRRI team also observed in January 1986 that "there are no facilities for development and evaluation of technology" in Cambodia (Khush *et al.* 1986). Most of the infrastructure had been destroyed. The IRRI mission received a request from the Ministry of Agriculture to assist in establishing a rice research and training centre. Following an evaluation of different sites, complex and difficult negotiations with landowners, the government, and donors, and many years of functioning as the *de facto* national rice research institute, CARDI was formally established in 1999 and inaugurated by Prime Minister Hun Sen in 2000 (Puckridge 2004). Fully consistent with Swaminathan's vision of the vital role of a national research institution, Hun Sen stated in his inauguration speech: "CARDI should also have an important role to play in networking with regional and international research institutes and centres to strengthen the cooperation in research and exchange of experiences, outcomes and technical information of scientific value" (Denning 2023).

Professor Swaminathan had the unique perspective of having served as leader in both a national agricultural research institution — the Indian Council of Agricultural Research — and an international agricultural research centre — IRRI. He appreciated that a strong national research institution is a prerequisite for international cooperation. In his own words: "If we wish developing countries to progress in agriculture, we must help them to build strong National Agricultural Research Systems. The stronger the NARS, the greater the benefit of the International Agricultural Research Centres." Moreover, Swaminathan ventured: "This will confer long-term benefits and also help strengthen the morale and capability of national scientists, working on national salaries" (Rao 2013).

Rice Germplasm Conservation and Use

Perhaps the most striking example of international cooperation under this programme was the conservation and repatriation of Cambodia's unique diversity of rice varieties. The massive dislocation of people, disruption of farming, and distortion of policies left Cambodia's farmers with only remnants of their diverse, uniquely adapted, traditional rice varieties after the Khmer Rouge period. The Ministry of Agriculture and locally operating NGOs approached IRRI for assistance in locating the "lost" traditional varieties. In response, IRRI repatriated 766 traditional varieties that had been collected in December 1972 and January 1973 and safely stored in the International Rice Genebank at IRRI headquarters in the Philippines (IRRI 2020). IRRI and Cambodian scientists purified, evaluated, and reintroduced many of these varieties to meet the needs of Cambodia's diverse rainfed conditions, where modern

varieties developed elsewhere for more favourable environments were found poorly adapted.

One traditional Cambodian variety, *Phka Rumduol*, was chosen five times as the World's Best Rice at the Rice Trader World Rice Conferences (2012, 2013, 2014, 2018 and 2022) (Hin Pisei 2022). CARDI developed and released *Phka Rumduol* in 1999 with the support of CIAP. The important task of conserving Cambodia's rice varieties continues today under CARDI's leadership, in cooperation with IRRI.

Impact on Rice Production

The long-term impact of IRRI's cooperation with Cambodia is difficult to quantify. Nevertheless, it is appropriate, in the light of the preceding historical sketch, to at least reflect on the pattern of rice production in Cambodia from 1961 to the near present (Figure 1). From a prewar production level of almost 4 million metric tonnes, annual rice production fell to around one million metric tonnes immediately before and during the Khmer Rouge period because of the flawed policies and technologies described earlier. National production in 1979 was just 540,000 metric tonnes. By 1985, six years after the Khmer Rouge was removed from Phnom Penh, the country's rice production had recovered to about 2 million metric tonnes per year, primarily through a threefold expansion of planted area. Production has subsequently increased to 11 million tonnes per year in 2020 (a 5 per cent annual

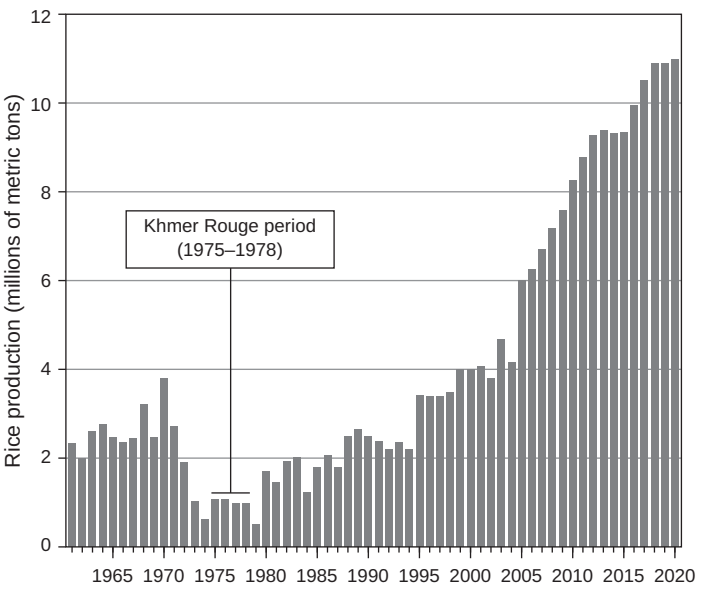

Figure 1 Rice production in Cambodia, 1961–2020.
Source: FAOSTAT, http://www.fao.org/faostat/en/#data/QCL.

growth rate), through a combination of further doubling of the harvested area and a more than doubling of yield per hectare to 3.8 tonnes/ha — exceeding the elusive target set by the Khmer Rouge.[3]

Even as Cambodia's population approached 17 million in 2023, the nation was generating enough surplus rice to emerge as a significant exporter. In 2020, the country officially exported 700,000 tonnes of milled rice, mainly to China and the European Union. Fragrant (jasmine) rice — including CARDI's *Phka Rumduol* — made up 80 percent of those exports. A further 3 million metric tonnes of unmilled (paddy) rice was exported informally to neighbouring countries. The total value of these formal and informal exports exceeded US$1.26 billion.[4]

The experience of Cambodia — replicated on a more limited scale in neighbouring Lao PDR — marked a very different phase of Asia's green revolution. Much of the surplus production emerged in rainfed rather than irrigated land. And it was not IRRI-bred varieties that were making the difference. Instead, most of Cambodia's additional rice came through the reintroduction and further improvement of Cambodia's traditional rice varieties, coupled with improvements in crop management. While the yield improvements were modest compared with those in Vietnam and Indonesia, where most of the rice is grown under irrigated conditions, adopting improved rice-production practices helped boost rural incomes and reduce poverty in Cambodia.

Legacy and Lessons

Under Professor Swaminathan's leadership, IRRI implemented a programme in Lao PDR of similar scale to the Cambodian project; it was led by John Schiller and Lao colleagues and had financial support from the Swiss government (Williams and Cramb 2020). As part of the IRRI–Indochina Program, IRRI partnered with Professor Vo-Tong Xuan, then the Vice Rector of Can Tho University, to reenergize a long-standing programme of cooperation with Vietnam (Denning and Xuan 1995). While the experience gained and lessons learned from Cambodia have stood out among the others, some important success factors emerge as relevant today as we ponder the recovery of nations and regions devastated by war and neglect, as follows:

- the transformational potential of science and technology
- the contributions of national institutional and human resource capacity
- the power of international collaboration
- the ingenuity and resilience of local farmers

[3] See FAOSTAT, http://www.fao.org/faostat/en/#data/QCL.

[4] These figures are attributed to the Cambodian Minister of Agriculture, Forestry and Fisheries, Veng Sakhon, reported in Vireak (2021).

These factors were most elegantly summarized and articulated by Professor Swaminathan in 2012 as the synergy of "scientific know-how, political do-how, and farmers' participation" (Swaminathan 2012). They had worked for Swaminathan and for India two decades earlier in the green revolution. In Cambodia, a less well-known chapter in the extraordinary life of Professor M. S. Swaminathan, these factors were again the core ingredients of agrarian transformation that enabled the country to recover from the conflict and genocide and emerge as food-secure and eventually as a modest exporter of the world's most widely consumed staple.

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