Keynote Address

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At the outset I would like to express my deepest appreciation to the Tropical Agriculture Research Center, in particular to the Director General, Dr. Ken-ichi Hayashi, for according me the honor to present the keynote address at this Symposium. It is all the more significant for me considering that Malaysia barely figures in the international rice scene, either as a producer or a leader in technology, or as a factor in the international rice trade.

Rice is an ancient grain with the beginnings of its culture dating to antiquity, and while its historical homeland is believed to be monsoonal Asia it is today grown in every continent in the world except Antarctica. Its distribution has been noted up to 50°N latitude in China, to 35–40°S latitude and at elevations of 800 meters in the tropics (CHANDLER, 1979). It occupies a position of overwhelming importance in the global food system and is clearly the single most important food crop of the world if one considers the area under rice cultivation and the number of people dependent upon it. Between one-third and one-half of the world's population depends on rice as a primary dietary staple. It is however in Asia that rice assumes special significance. Currently there are about 144 million hectares of rice planted worldwide of which over 90% is in Asia (DE DATTA, 1981). The Asian rice-growing region itself exhibits a wide diversity in the climatic, physical, technological and socio-economic environments in which rice is grown. This rice-growing region is bounded on the East by Japan and Pakistan to the West and extends from about 50°N latitude in China to about 10°S latitude in Southeast Asia. Geographically the region consists of *East Asia* in the temperate zone North of the Tropic of Cancer which includes three major rice-growing countries — China, Japan and Korea; *South Asia* with five rice-growing countries — India, Pakistan, Sri Lanka, Bangladesh and Nepal with subtropical to tropical climate; and *Southeast Asia* with an entirely tropical climate and eight major rice-growing countries — Burma, Indonesia, Laos, Kampuchea, Malaysia, Philippines, Thailand and Vietnam. In the Asian region the variety of rice farming systems is indeed large, ranging from traditional labor intensive systems characterized by technology handed down through generations, to rice systems with intensive modern irrigation facilities, capital-intensive and with high levels of mechanical and chemical technology. Rice yields too vary tremendously with the highest, in excess of 5.8 tons per hectare attained in the temperate zone, notably Japan and Korea, to 1.2–2 tons per hectare in the tropics in Laos, Cambodia and Bangladesh (DE DATTA, 1981).

Cropping systems based on rice are the predominant form of agriculture in most of Asia and the crop not only dominates production patterns, but is also woven into the social and economic fabric of Asian life, and in many instances has been of importance in the political arena.

The tropical region is defined as the area between the Tropic of Cancer and the Tropic of Capricorn, and in Asia it includes most of the rice-growing areas of India, all of the other South and Southeast Asian countries, most of Taiwan, and a part of Southern China. Outside of Asia, it includes all of the West African rice-growing areas and most of rice areas in Central and South America, where it is largely grown as rainfed upland rice with irrigation development in its early stages. In the context of tropical Asia, if one includes all of the Indian rice lands and

those portions of China and Taiwan within the tropics, close to 100 million hectares or 70% of the world's rice lands are to be found. As a region, tropical Asia as so defined, comprises an enormous concentration of a rice-eating population, high rates of population growth, and as a consequence, the major region of rice demand growth in the future. The region includes the world's largest exporter of rice (Thailand), and until recently its largest importer (Indonesia), with other countries ranging from marginal exporters to net importers. For the region as a whole, with few notable exceptions, increasing rice production either to feed an expanding population or increasing exportable surpluses are important national development priorities.

While the bulk of rice cultivation is undertaken under flooded field conditions, the rice lands of tropical Asia vary greatly with respect to the type of water regimes facing crop production, as shown in Table 1.

Table 1 Estimate of percentage of rice crop area and production by specified environmental complex in Southeast Asia

Type of cropping	Percent of area	Percent of production
Single crop irrigated	14	19
Double crop irrigated	19	31
Upland	10	5
Floating rice	8	4
Medium deep rainfed and deep water	15	8
Shallow rainfed	34	33

Source: BARKER and HERDT (1979).

Given the scarcity of arable land, the rice farmers of tropical Asia have only two realistic approaches for increasing production — they can increase crop yields or they can increase the number of rice crops grown each year. In certain favorable situations a combined approach attempting both yield increase and cropping intensity increase can be sought. The development of high-yielding pest-resistant rice varieties with short maturation period, availability of farm mechanization to overcome time constraints and the improvement of direct seeding techniques have created a potential for increasing cropping intensities throughout the tropics. Unlike the temperate zone where temperature is the dominant factor and cold weather limits rice production to one crop per year, in the tropics rainfall is the dominant climatic variable and the rice crop is limited to the rainy season unless irrigation is available. With very few exceptions, notably in small parts of southeastern Sri Lanka and the southern Philippines it has not been possible to implement double cropping without irrigation (BARKER and HERDT, 1985, p.24). Also, cool temperatures during parts of the year at elevations above 1,000 meters and latitudes above 20° have been noted as a factor inhibiting double cropping of indica rice even though water may be adequate (BARKER and HERDT, 1985, p.24). However, the key factor in the dissemination of double cropping for most of tropical Asia will remain the availability of irrigation.

The experience of double cropping is not new in the tropics and today it is significant in every country except Thailand, Laos and Kampuchea. The limitation of irrigation however restricts it to about 19% of the rice lands of Southeast Asia, but a measure of its importance is that it contributes 31% of production and in proportionate terms irrigation development for double cropping would appear to be the most promising avenue for expanding rice production. A further benefit of irrigation development is increased stability of production compared with the rainfed situation, and is the single most important requirement for the adoption of high yield technology.

Presently, however, the costs of new irrigation development, particularly if storage reservoirs, pumping and intensive on-farm distribution and drainage channels are included, are very high in relation to the financial and technical resources of many developing countries. BARKER and HERDT (1985) citing figures from the Trilateral Commission Report of 1978 suggest that rice production in the developing countries of Asia could double in the 15 year period (1978-93) by increasing total irrigated area to the potential of 86.8 million hectares with two-thirds of it irrigated for double cropping. The total capital cost however is estimated at US$52.6 billion (1975 dollars) or about US$3.5 billion per year, and at a growth rate in irrigated area of 6.7% per annum compared to the present 2%.

While crucial to expansion of double cropping, the importance of irrigation alone should not be overrated in relation to the other production inputs. The complementarity between irrigation and modern short duration rice varieties, high levels of fertilizer use, enhanced pest and disease management and in some instances the need for farm mechanization, have been widely recognized. The shift to double cropping technology in all cases involves purchased inputs, and in many instances the wide variation in the socio-economic conditions under which farmers operate determines their access to these technologies. The generally small resource position of farmers requires institutional assistance in the form of credit to enable purchase of inputs. Marketing reforms and adequate rice prices are needed to make adoption of the new technologies worthwhile. Institutional arrangements through which farmers have access to land (particularly tenure systems) and markets may also need intervention.

In summary, the tropics possess an enormous potential for the expansion of rice production through dissemination of double cropping, but will require substantial public investments in new irrigation development. The essentially rice-based agricultural systems and a growing population depending on rice as the major dietary staple may make such investments worthwhile in a long run perspective. The complementarity between irrigation and other inputs for successful double cropping is widely recognized. However the widely varying institutional and socio-economic conditions under which rice farmers in the tropics operate will also require serious examination if double cropping is to be successfully disseminated.

References

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