The theme of this special issue is expressed by the title of this editorial. The papers in this special issue are derived from an international conference with the same title, held in November 1995 at the Bureau of Soil and Water Management (BSWM) in Manila. The conference was sponsored and funded by the Australian Center for International Agricultural Research (ACIAR) to review and summarise the results of an international collaborative project (Project 8938) involving Indonesia, the Philippines and Australia. Also invited were scientists from a range of other countries and institutions with expertise on rice-based systems. These include scientists from the International Rice Research Institute (IRRI), the Philippine Rice Research Institute, Tamil Nadu University in southern India, and the Rice-Wheat Consortium in India, ICRISAT and the CSIRO Division of Water Resources in Griffith, Australia. The conference covered both irrigated and rainfed lowland rice-based cropping systems. Papers from the conference can be found in the edited conference proceedings published by ACIAR (Kirchhof and So, 1996). This special issue contains selected and revised papers from these proceedings, based on the outcome of the conference.

Rice is the most important staple food in Asian countries. The 1994 UN Food and Agriculture Organisation (FAO) Yearbook stated that the total global area under rice was 147 million ha, and 130 million of that is in Asia. Records from the International Rice Research Institute (IRRI) in 1995 showed that the vast majority of rice is grown as paddy or lowland rice, either under irrigated (81 million ha globally, 93% in Asia) or dryland conditions (40 million ha). The most common and traditional soil management strategy for paddy rice is to puddle (wet cultivation) the soil before rice seedlings are manually transplanted. Puddling is in fact the most important soil management practice for rice production. It serves primarily to reduce the soil's hydraulic conductivity and to ensure that inundated conditions are maintained during the cropping cycle so that weeds are easily controlled and water stress avoided. It creates a soft soil and makes transplanting of seedlings easy and allows rapid establishment of the transplanted seedlings. This system has been practised for centuries and was derived from the time when rice was a long season crop of 150 days or longer. At that time, it was essential that seeds be germinated very early to take advantage of the first rain of the season and gain time while preparing the land. It was later transplanted which allows the inundated rice crop to fit within the rainy season. Thus, early germination is then essential to avoid terminal water stress and avoid the risk of reduced yields. However, with the modern, short season, high yielding rice cultivars, the need for early germination is no longer essential for the success of the crop. However, as old habits are not easily altered, the practice has not changed substantially despite significant efforts being invested into dry seeding of rice.

Where irrigation is available, inundated conditions can be maintained to grow two or three lowland rice crops a year. Where irrigation is not available, one lowland rice crop is generally grown under rain-fed conditions during the rainy season, and only during periods where rainfall exceeds 200 mm a month. Where rainfall is erratic, the rice crop may be grown as lowland but may complete its cycle as an upland crop. It is generally accepted that inundated conditions can be maintained if rainfall exceeds the amount of water lost through evaporation (an average of 4 mm/day) and percolation which must be kept to 2 mm/day.
or less. Hence a primary reason for puddling is to reduce the soils’ hydraulic conductivity. However, the previously puddled soil layer poses considerable restrictions on cropping after rice. Although beneficial for rice, soil puddling has an adverse effect on the physical properties of the soil. Anaerobic conditions are unfavourable for upland crop establishment and growth while the puddled layer is wet. Upon drying it becomes dry very quickly and will severely restrict root growth.

Following several months of inundation during the rice phase, the subsoil water contents are generally high and except in sandy soils, it is generally sufficient to grow an upland crop with a moderate to high yield, such as legumes, provided the crop can access that water. However, yields of these dry season crops under rainfed conditions are generally very low and unreliable. Yields of mungbean of <0.5 Mg ha$^{-1}$ and maize of <1 Mg ha$^{-1}$ were not uncommon. These low yields do not provide adequate incentives and the farmer tends to leave the land fallow until the next rice crop. Therefore, the land after lowland rice represents an underutilized resource. There are more than 40 million ha in Asia and potentially 100 million ha in Africa where suitable soil management techniques would allow exploitation of unused subsoil water stores. The potential benefit in bringing these soils into production during the dry season is not only in increased food production but also in diversification and an improved nutritional quality. Mungbean, for example, is called ‘the poor man’s meat’ in the Philippines. An increase in production in rainfed lowland areas would greatly benefit the rural economy of developing nations and the farmers’ well being.

The Australian Centre for International Agricultural Research (ACIAR) funded this project on the ‘Management of Clay Soils for Lowland Rice-based Cropping Systems’ from 1992–1996. The project aimed to investigate management practices suitable to the developing countries of Asia that can be used to grow food legumes after the rice crop on the puddled rice soils. It showed conclusively that puddling is not necessary and an omission of this centuries-old practice is possible without yield losses, and it will provide substantial savings to the farmer and the rural economy of these countries. The project has also shown that technically, it is possible to grow a reasonable crop of legumes immediately following rice harvest, in areas where the rainy season is at least a month longer that the rice season. However the adoption of a technically sound method is often dependent on other socio-economic factors such as the availability of labour at the right time and competition for that labour by other industries in the region. The ability to sow rice early in the rainy season will increase the opportunities to grow successful legume crops after lowland rice and new technologies to achieve this are available, such as the reduction of bypass flow from the early season rainfall and direct seeding of rice.

Finally, we wish to thank the authors of the seven papers in this special issue for the efforts in the preparation of their papers and the Australian Center for International Agricultural Research (ACIAR) for their enthusiastic support and generous funding for the project and the international conference to report the results to an international scientific community concerned with rice-based cropping systems.

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