

HERBICIDE USE IN ASIAN RICE PRODUCTION: PERSPECTIVES FROM ECONOMICS, ECOLOGY, AND THE AGRICULTURAL SCIENCES

R. Naylor

Herbicides now appear to be an inescapable fixture in Asian rice economies. But an essential concern remains: how best to govern their use. Addressing this issue requires knowledge—of the economic determinants of herbicide use, of the potential effects of herbicides on society and ecosystems, of the options for integrating herbicides into a broader weed management strategy, and of appropriate roles for the public and private sectors within different countries.

Although herbicide use in Asian rice production is still at an early stage of evolution, it is progressing at an extremely rapid rate. Understanding the dynamics and potential consequences of widespread herbicide applications on the ricefields of densely populated regions of Asia is therefore critical, if long-term damage that could accrue from overuse or misuse of these chemicals is to be avoided.

ECONOMIC DETERMINANTS OF HERBICIDE USE

Weeds are the most severe and widespread biological constraint to rice production (Herdt 1991; Moody 1990, 1991). Potential yield reductions caused by uncontrolled weed growth throughout a crop season have been estimated to be in the range of 45-95%, depending on the cultural system; cropping season; plant spacing; amount of fertilizer applied; ecological and climatic conditions; and duration, time, type, and amount of weed infestation (Moody 1991, Ampong-Nyarko and De Datta 1991). Even using a more conservative estimate of a 10-15% yield reduction in well-managed fields (Ampong-Nyarko and De Datta 1991, Baltazar and De Datta 1992), losses caused by weeds in Asian rice systems amount to approximately 50 million tons of rough rice, valued at more than US\$10 billion in 1995 (World Bank 1996).

Traditionally, weeding of rice in Asia has been done by hand. The availability of inexpensive, unskilled workers in rural areas made labor-intensive agricultural practices cost-effective for farmers and a source of income for millions of laborers. Now,