Efficient Use of Nitrogen in Cropping Systems

Efficient use of N in cropping systems is often viewed from agronomic, economic, or environmental perspectives. A given N management system may provide highly efficient use of N from one perspective but be relatively inefficient from another. This chapter reviews basic factors affecting N use efficiency (NUE) from agronomic, economic, and environmental perspectives and discusses interrelationships among these perspectives. The agronomic section reviews ways of characterizing NUE based on yield and N recovery in relation to N inputs and discusses physical potentials and limitations for improving these relationships. Since Chapt. 17 (this book) deals with the role of N in attaining high yield potentials, the agronomic section in this chapter emphasizes factors affecting the slope of yield curves rather than factors affecting maximum yield levels with a nonlimiting N rate. The economic section reviews factors that determine optimum N rates and discusses economic considerations for optimizing inputs (e.g., application practices and nitrification inhibitors) that affect the slope of yield curves. The environmental section examines relationships between N fertilizer recovery and environmental impact of N fertilizer use and also environmental implications of maximizing return from N fertilizer use.

I. AGRONOMIC PERSPECTIVE

A. Characterizing Efficiency

The phrase *N use efficiency* (NUE) usually has referred to relationships between yield and N rate (yield efficiency), N recovered and N rate (N recovery efficiency), or yield and N recovered (physiological efficiency). For