

Module 4.1-2 Calculating fertilizer rates in cereals using omission plot data. The nutrient omission plot approach for calculating fertilizer rates for cereals (rice, wheat, maize) utilizes information on grain yields obtained in plots with the nutrient in question omitted and at ample levels. Other nutrients are applied to ensure they are not limiting yield. The yield of the omission plot is used as an indirect estimate of soil supplying capacity of the omitted nutrient. The grain yield difference between the omission plot and the one fertilized at an ample level can be used to estimate fertilizer rate required for various target yields.

Table 1. Yields from an omission plot experiment in winter wheat from India.

Treatment	Yield, kg/ha
1. Ample rates of N, P, and K	5,556
2. N omitted; ample rates of P and K	1,667

Since the rate of N applied in the “ample” plot in **Table 1** was 150 kg/ha, agronomic efficiency (AE_N) of this plot was $(5,556 - 1,667)/150$ or 26 kg of grain per kg of N fertilizer.

If one assumes similar soil N supply capacity, and a similar level of efficiency (26 kg/kg), for other fields in the area, **Table 2** shows the resulting rates that would be recommended for different target yields (e.g. fields #1 and #2). If an omission plot in the area with a different preceding crop was conducted and gave a yield as for field #3 below, that information too could be used in the rate calculation.

Table 2. Rate calculation for three example winter wheat fields.

Field #	Yield target, kg/ha	Omission plot yield, kg/ha	Calculated N rate, kg/ha
1	6,500	1,667	$(6,500 - 1,667)/26 = 186$
2	4,500	1,667	$(4,500 - 1,667)/26 = 109$
3	6,500	2,500	$(6,500 - 2,500)/26 = 154$

Compared to values obtained across many trials, the AE_N calculated from the data in **Table 1** is relatively high (see Section 4.4 and **Table 3**). Recommendations are most accurate when site-specific local values for AE_N , omission plot yield, and target yield can be obtained.

Table 3. Observed ranges of AE_N for cereals from selected agronomic experiments in India.

Crop	N applied only ¹	N with ample P and K ¹	Farmers' practice, Punjab ²	Site-specific nutrient management
Maize	4-7	7-14	—	26-28 ³
Wheat	7-12	17-24	—	20-28 ³
Rice	7-12	14-23	8-10	22-34 ⁴

¹ Biswas, P.P. and P.D. Sharma. 2008. Indian J. Fert. 4(7):59-62.

² Khurana, H.S. et al., 2007. Agron J. 99:1436-1447.

³ IPNI Unpublished data, 2011.

⁴ Singh, B. et al. 2012. Field Crops Research 126:63-69.

The nutrient omission approach can be a sound alternative to a soil test-based approach, in regions of the world where reliable soil analysis services are unavailable. This situation is prevalent in many developing countries.

Submitted by K. Majumdar, IPNI, India, January 2012.