

# Economics of Improved Fertilizer Recommendations in Annual Crops

Economics is an important consideration in the development of a successful fertilizer recommendation approach. Fertilizer inputs constitute up to about 30% of the variable resource inputs in annual crops. Thus, to growers, profitability is an important factor that affects their decision regarding fertilizer application.

## Improved recommendations for maize and wheat with Nutrient Expert®

Nutrient Expert® (NE) promotes balanced application of nutrients and efficient use of fertilizers by providing recommendations based on crop nutrient requirements tailored to location-specific conditions. NE was used to develop fertilizer recommendations for hybrid maize (Nutrient Expert® for Hybrid Maize, Figure 1) and wheat (Nutrient Expert® for Wheat, Figure 2) for specific fields or growing environments in Asia. For both maize and wheat, NE recommendations for N, P, and K varied across locations reflecting the differences in site characteristics and farming practices (climate, soil, cropping system, farmers' yield and inputs, residue management, etc.), which affect attainable yield and crop response to fertilizer. In the case of maize, however, farmers' application rates were much more variable than the NE rates. NE improved fertilizer application rates by reducing the rates where farmers over-applied or by increasing the rates where farmers' applications rates were lower than the optimal rates.

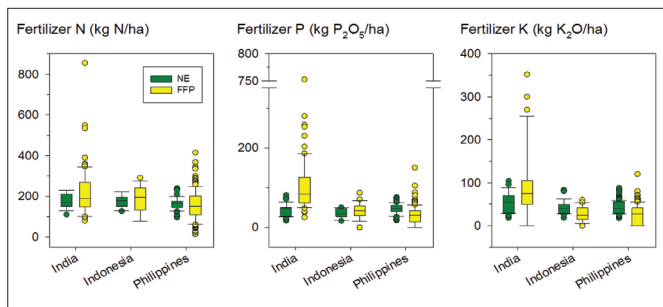


Figure 1. Fertilizer N, P, and K application rates (kg/ha) in maize using Nutrient Expert® for Hybrid Maize (NE) and farmers' practice (FFP) in India, Indonesia, and the Philippines, 2010-2013.

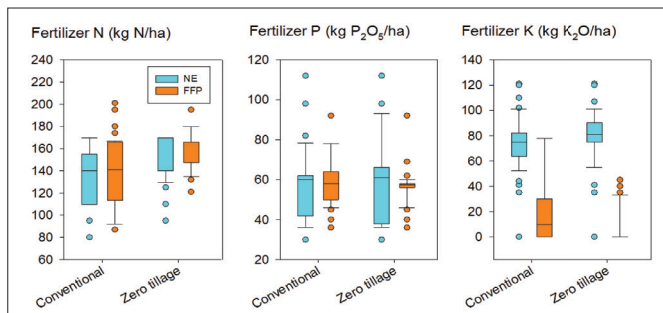


Figure 2. Fertilizer N, P, and K application rates (kg/ha) in wheat using Nutrient Expert® for Wheat (NE) and farmers' practice (FFP) under conventional and zero tillage practices in India 2010-2012.

## Economics of improved recommendations for maize and wheat in Asia

Fertilizer recommendations can either increase or decrease fertilizer costs, depending on the current farmer's practice (Table). If farmer's practice is below the optimal rate or unbalanced (e.g. application of N, P but not K), NE recommendations will likely increase fertilizer cost. If farmers apply nutrients excessively, NE recommendations will likely lead to a significant reduction in fertilizer costs, hence, improving the economic benefits. Nevertheless, the economic profitability of an improved recommendation is affected more by the increase in grain yield. Field-testing of NE recommendations showed increase in grain yield and economic benefits in maize and wheat regardless of the increase or decrease in fertilizer costs over the current farmers' practices (Table). While economic gains are tangible, good stewardship of the environment is ensured through the NE approach of providing fertilizer recommendations. NE promotes the application of nutrients using the 4R Nutrient Stewardship concept, i.e., apply the right source of nutrients, at the right rate, at the right time, and in the right place.



A maize cob from the Nutrient Expert® plot in Southern India. Photo by M. Pampolino

Table. Economics of improved fertilizer recommendations with Nutrient Expert® (NE) in maize and wheat.

Parameter	Unit	Effect of NE (NE – FFP)				
		NE Maize			NE Wheat <sup>†</sup>	
		India (n = 81)	Indonesia (n = 26)	Philippines (n = 190)	CT (n = 49)	ZT (n = 78)
Grain yield	t/ha	+1.12	+0.92	+1.10	+0.75	+0.71
Fertilizer N	kg/ha	-46	-12	+4	-6	-9
Fertilizer P <sub>2</sub> O <sub>5</sub>	kg/ha	-68	-5	+18	-3	+2
Fertilizer K <sub>2</sub> O	kg/ha	-37	+15	+18	+55	+72
Fertilizer cost	USD/ha	-71	+16	+38	+16	+24
GRF <sup>‡</sup>	USD/ha	+304	+234	+275	+166	+151

<sup>†</sup>CT = conventional tillage; ZT = zero tillage; <sup>‡</sup>GRF = gross return above fertilizer costs