Bulk Blending of Fertilizers for Improved Fertilization in Oil Palm

Most oil palms are grown on soils with poor inherent fertility (Mutert, 2001), and the harvest and removal of fresh fruit bunches from the field takes away nutrients that must be replaced for sustainable high yield. Fertilization is therefore a major activity, with its cost accounting for some 30-50% of the on-farm cost of oil palm production (Donough, 2008).

Straight fertilizers have traditionally been used by oil palm growers for their lower cost. Depending on the estimated requirement of nutrients for a given location, as many as 8 applications of straight fertilizer may be needed each year, usually comprising 2-3 rounds of nitrogen (N), 2 rounds of potassium (K), and 1 round each of phosphorus (P), magnesium (Mg) and boron (B).

Fertilizer application in oil palm plantations has mainly been a manual operation. With labour availability becoming an increasing problem in the last 3 decades, completion of annual fertilization programs has become a challenge for plantation managers. Mechanized application using fertilizer spreaders is often limited by field conditions, with most areas unprepared for machine access especially since the advent of 'zero burn' land development. Other problems related to fertilization faced by plantation managers include logistics (movement) & storage (on-site store facilities) of large quantities of straight fertilizers. Timely applications according to the recommended schedule is often difficult to achieve.

With optimal fertilization practices, fertilizer use in oil palm production is highly profitable (Mutert, 2001; Donough, 2008). However, the effect of sub-optimal fertilization practices on yield and profitability in commercial plantation operations is hard to quantify. Measurements of fertilizer recovery efficiency in oil palm field experiments, where practices are strictly controlled, showed generally low values (Chew et al., 1999; Prabowo et al., 2002). Inefficiency in large commercial operations will certainly be even higher given the operational problems associated with fertilization as highlighted earlier.

With the price differential between straight and compound fertilizers narrowing since 2008, the use of compounds has increased. However, the fixed nutrient ratios in commonly available compounds seldom fit actual requirements in the field, leading to nutrient imbalance, unless top-up applications with straights are done, which then negates the logistical advantages of using compounds.

Bulk blends produced using carefully chosen fertilizer components and fitting the site-specific nutrient ratios required in plantations can provide an answer to the operational problems currently associated with optimal management of fertilization.

By using tailored bulk blends, oil palm growers can reduce their total annual number of applications, e.g. from the current 6-8 rounds to a more manageable 4 rounds a year. Yet, the frequency of application of each nutrient is actually increased – from the usual 1-2 rounds a year per nutrient, to 4 rounds a year for each nutrient. This increase in frequency of application improves fertilizer recovery efficiency especially in areas where likely loss of applied fertilizers is high (Gerendas et al., 2013). Application of nutrients together can also bring about synergistic effects, leading to higher yield compared to the effect of each nutrient applied singly (Chan, 1982), and improved uptake efficiency (Gerendas, *pers comm* 2011). Better fertilizer recovery efficiency will reduce the quantity of fertilizer required as the same yield can be obtained at a lower rate of fertilization. Fertilizer logistics and on-farm storage will become easier.

The advantages observed from using tailored bulk blends will encourage oil palm growers – large and small – to better optimize their fertilization practices according to the 4R Nutrient Stewardship concept promoted by IPNI (Bruulsema et al., 2012).

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