

KNOWING YOUR FERTILISER RIGHT:

The 4R's

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BACKGROUND

Returns to fertiliser addition in terms of increased production and subsequent monetary value is large. Smallholders however see the fertiliser cost as an additional burden to them. The best management practice (BMP) for fertiliser known as the "4R's of Fertiliser" was introduced and discussed by Bruulsema *et al.*, (2009). The 4R's ensures that the Right Type is applied at the Right Rate, Right Place and at the Right Time. In every fertiliser application, the 4R's must be used as checklist to determine whether palms have been fertilised properly. The 4R's are inter-dependent and none can be right when any one of them is wrong.

In this article, the 4Rs are discussed for smallholder growers in Papua New Guinea (PNG).

RIGHT TYPE

A wide range of fertilisers are available on the market in different forms and with different roles. Depending on nutrient compositions, fertilisers alleviate specific nutritional deficiency problems faced by palms. Selecting the right fertiliser type is determined by identifying which nutrients are required for optimal plant growth through preliminary soil survey and annual tissue analysis results. For smallholders in PNG, past work have determined the right type of fertilisers to apply within each of the oil palm project sites (Table 1).



Photo 1. Application of N fertiliser in a smallholder block.

Table 1. Nutrient type recommended for each sites in PNG

Project Site	Fertiliser type
Hoskins	Nitrogen (N)
Bialla	Nitrogen (N)
Poliamba	Nitrogen (N) and Potassium (K)
Popondetta (Plains)	Nitrogen (N)
Popondetta (Ilimo)	Nitrogen (N) and Potassium (K)
Milne Bay	Nitrogen (N) and Potassium (K)

The decision on right source of fertiliser for smallholders is determined by fertiliser responses specific to the soil type and the level of production by the growers. Nitrogen is the main driver for production and is highly recommended for smallholders in all sites. Apart from N, K in the form of Muriate of potash (MOP) is also recommended for smallholders in Ilimo/Papaki area in Popondetta, Milne Bay and New Ireland where K deficiency is widespread. MOP can also be recommended for high producing smallholders in WNB and Popondetta plains as long as they are able to meet the cost of applying MOP.

RIGHT RATE

Regardless of oil palm price or fertiliser cost, selecting the right rate is important. This is because under or over application of certain nutrient can have production, economic and environmental consequences. When fertiliser is under supplied, the palms will not get the adequate amount of nutrient they require for healthy growth and fresh fruit bunch production, therefore resulting in low production. On the other hand, if fertiliser is over applied, the chances of nutrient losses to the environment is increased and this results in increased fertiliser costs and also affects the environment. It is therefore important to apply correct fertiliser rates.

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Table 2. Rates recommended for each project site.

Site	Recommended rates (kg/palm/year)
Hoskins	0.68 kg N
Bialla	0.68 kg N
Poliamba	0.68 kg N & 2.0 kg MOP
Popondetta (Plains)	0.68 kg N
Popondetta (Ilimo)	0.68 kg N & 1.0 kg MOP
Milne Bay	0.68 kg N & 2.5 kg MOP

Note: For nitrogen, rates are given in a kilogram of element N instead of kg of N fertiliser source because N fertiliser sources used at different sites are changed every few years. For K, actual MOP rates are given.

RIGHT PLACE

The 5 management zones under oil palm stands are weeded circles (WC), harvest paths (HP), frond piles (FP), frond tips (FT) and the in-between zones (BZ) (Figure 1). Knowing the right zone to apply fertiliser maximises nutrient uptake by the palm roots and at the same time minimises potential losses.

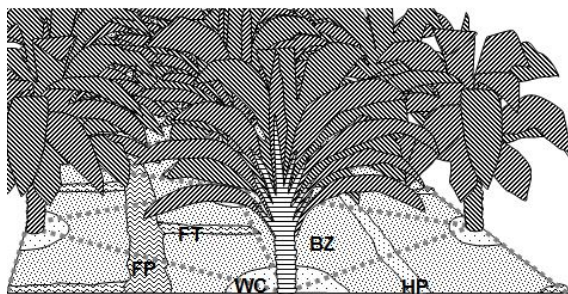


Figure 1. Different management zones under oil palm (Nelson *et. al.* 2006)

For matured palms, applying fertiliser in wrong places increases the chances of leaching losses (Banabas 2007). A semi-circular band about 1.5-2 m away from the palm base which is just outside of the WC covering a mix of BZ, FT and FP is recommended for nitrogen fertiliser placement (Nelson *et. al.* 2006).

Muriate of potash (MOP) have limited mobility in the soil and should be applied in the FP and FT where there is high concentration of tertiary roots and organic matter. However for management convenience, it is best applied as N. For immature palms, application is done around the palm following the weeded circle.

RIGHT TIMING

The right timing concept is very important particularly for nitrogen source fertilisers that have greater potential for losses, denitrification, volatilisation, surface runoff and erosion processes. For oil palm, the question of when to apply fertiliser particularly any nitrogen fertiliser is dependent on weather. As a general rule of thumb, fertiliser should never be applied when the soil is very

wet or very dry. Similarly, applying fertiliser during the wet months of the year should be discouraged. The months not suitable for fertiliser application for all sites is shown in Table 3. Despite this, it is still possible to apply fertiliser within these months if the weather is fine.

Table 3. Months to avoid application of fertiliser for oil palm in PNG (Banabas, 2007)

Site	Months to avoid application
Hoskins, WNB	December, January, February, March
Bialla, WNB	December, January, February, March
New Ireland	November, December, January, February
Popondetta	November, December, January, February
Milne Bay	December, January, February, March

CONCLUSION

The 4R's basically form the basis for fertiliser best management practices in oil palm systems, which is all about selecting the right source of fertiliser, right rate, right place to apply and the right timing for application. Getting the 4R's right unlocks the full agronomic potential and economic benefits of fertiliser. It is therefore recommended for more trainings and awareness to smallholders on the 4Rs of fertiliser.

REFERENCES

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