

FORMULATION OF BALANCED FERTILIZER FOR OIL PALM

by: AHMAD TARMIZI MOHAMMED; HAMDAN A BAKAR; ZIN Z ZAKARIA
and ARIFFIN DARUS

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Oil palm yield potential is a function of inherent soil fertility status and very dependent on nutrient use efficiency. The soil fertility status would involve the understanding of interacting factors such as soil depth, soil structure, soil pH, soil organic matter and quantity of soil micro fauna and flora. In many cases, the nutrient use efficiency is related to agronomic practice. The nutrient status as influenced by the agronomic practice of fertilizer application is indicated in *Table 1*.

**TABLE 1. NUTRIENT STATUS
INFLUENCED BY AGRONOMIC
PRACTICES**

Soil nutrient status	Agronomic practices
Nutrient N, P, K, Mg and trace element contents with different degrees of availability	Amount, timing and frequency of fertilizer application
Storage capacity of soluble nutrients inherently from the soil and fertilizers applied	Soil and biomass management on nutrient cycling

OBJECTIVE

The objective of balanced fertilizer formulation is to have the various nutrients at the optimum quantity and balanced ratios to achieve an overall higher oil palm yield.

BALANCED NUTRIENT AMENDMENT

Nutrient amendments are essential for optimal growth and development of oil palms. The results achieved by applying optimum balanced nutrient are shown in *Table 2*.

**TABLE 2. APPLYING OPTIMUM
BALANCED NUTRIENTS**

Input	Output
Optimization of nutrients applied <i>i.e.</i> to provide essential nutrients	Maximum yield potential
Application of correct amount of fertilizers	Increased production efficiency (excessive fertilizer inputs, especially in marginal soils, will lead to wastage and inefficiency in the production system)
Selection of fertilizers with emphasis on balanced nutrient ratio	Reduced cost of production that leads to higher profit ratio



TABLE 3. DERIVATION OF FERTILIZER FORMULATION WITH BALANCED NUTRIENT RATIO

- Step 1 The fertilizer ratio must consider the amount of nutrients exported from the system.
- Step 2 The nutrient ratio: inference from fertilizer trials.
- Step 3 Consideration on the effectiveness of minerals used in the formulation.
- Step 4 Final formulation of fertilizer blend in the compound fertilizer.

Derivation of fertilizer formulation with balanced nutrient ratio is carried out according to hierarchical approach shown in *Table 3*.

From a typical yield response curve as shown in *Figure 1*, fresh fruit bunches (FFB) of 28 t can be achieved by applying either one of the following fertilizer combinations: (a) 3.1 kg of ammonia sulphate (SOA) and 6 kg of potassium chloride

(MOP); (b) 4.2 kg of SOA and 3 kg of MOP. The second fertilizer combination is more effective and a lot cheaper than the first fertilizer combination.

The optimum economic return is dependent on cost to revenue ratio of fertilizers to yield. At the same time, amount of fertilizers and different nutrient ratios affecting the revenue gain. Yield is considerably higher when the optimum balanced fertilizers are applied. For example, results from the observation blocks are shown in *Table 4*. Applying balanced nutrients of 9.2 kg palm⁻¹ is undoubtedly profitable.

APPLICATION OF BALANCED COMPOUND FERTILIZER

It is important for oil palm growers to use optimum balanced fertilizers to raise their yield. As nutrient requirement is site-specific, the balanced nutrient ratio in such formulated compound fertilizers will provide a sound nutrient input needed at the various locations. For some soils such as peat, an additional round of booster dose of MOP will be required for higher yield maximization.

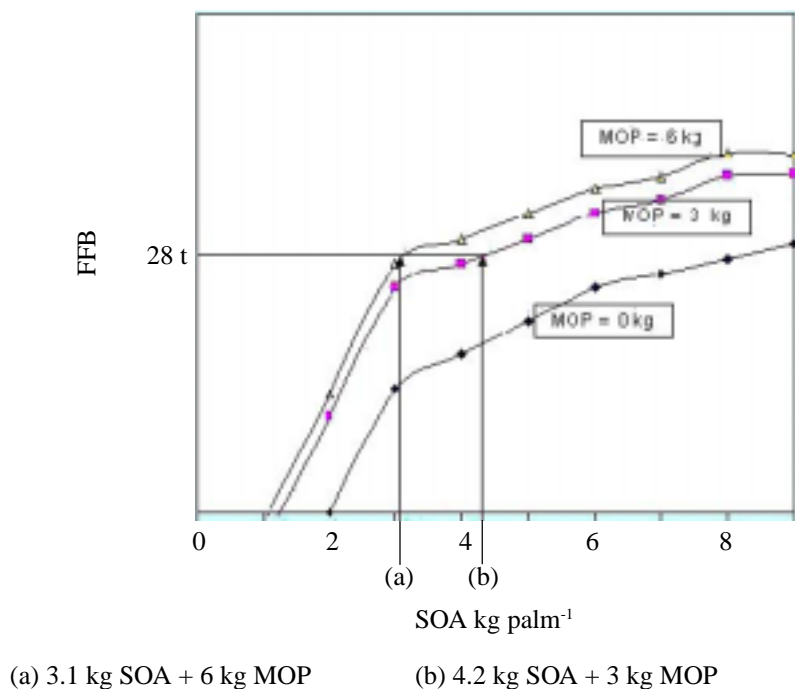


Figure 1. Typical fresh fruit bunches (FFB) yield response to N and K fertilizers.

Besides higher yield, there are other benefits in terms of cost savings. The advantages of using optimum balanced fertilizer in compound form are shown in *Table 5*.

Manufacturing of an optimum balanced compound fertilizer is one of the ways to improve the fertilizer efficiency and increase productivity especially for smallholder sector.

TABLE 4. HIGHER REVENUE GAIN BY APPLYING OPTIMUM BALANCED FERTILIZER

Fertilizer (kg palm⁻¹)	N(%)	P(%)	K₂O(%)	MgO(%)	Borate(%)	FFB (t ha⁻¹ yr⁻¹)	*Cost/ha (RM)	**Revenue/ha (RM)	***CR
9.2	8.0	7.0	16.3	2.9	0.6	33	3 328	6 897	0.48
8.0	9.2	4.0	26.3	-	-	27	2 777	5 643	0.49

Notes: Calculations were based on the following:

SOA (ammonium sulphate - RM 450 t⁻¹); PR (phosphate rock - RM 320 t⁻¹);

MOP (potassium chloride - RM 650 t⁻¹); Kieserite (RM 550 t⁻¹); Borate (RM 1300 t⁻¹).

* Inclusive of fertilizer application, harvesting and transportation cost.

**CPO price at RM 1100 t⁻¹ and OER of 19%.

*** C/R (Cost to revenue ratio).

TABLE 5. ADVANTAGES OF USING OPTIMUM BALANCED FERTILIZER

Components	Benefits
Provide the vital nutrient balance	Increase FFB and oil yield
Reduce fertilizer application rounds	Reduce cost and labour
Good physical properties	Easy to apply Longer shelf life (six months)
Cost-effective	Value for money

For more information kindly contact:

Director-General
MPOB
P. O. Box 10620
50720 Kuala Lumpur, Malaysia.
Tel: 03-89259155, 89259775,
Website: <http://mpob.gov.my>
Telefax: 03-89259446