

# FERTILIZER INCREASES YOUR COCONUT YIELD



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## Introduction

The coconut palm continuously draws nutrients from the soil for its growth and nut production. Of the nutrients that is taken by the palm, a substantial portion is lost by the removal of leaves and nuts, which depletes the soil considerably. In order to maintain soil fertility, fertilizer must be added to the soil. Fertilizers supply plant nutrients to the soil but only a portion of those nutrients are made available to the palm. Part of these nutrients are fixed in the soil and are unavailable to the palm. Nutrients are also lost due to leaching, erosion and due to escape from soil as a gas. Therefore adequate amounts of fertilizer must be added to compensate for these losses and to meet the requirements of the palm.

In Sri Lanka, coconut is cultivated under a variety of soil types of varied fertility levels under different agroclimatic conditions. Palms growing in the dry zone experience only one monsoon per year with an annual rainfall of less than 1300 mm. In the dry zone, coconut soils are mainly sandy (Puttalam, Pallai, Mul-

lativu, Batticaloa, Hambantota) and poor in fertility. The wet zone receives both monsoons of the year and an annual rainfall of more than 1900 mm. Coconut soils in this zone are mainly lateritic gravel with an underlying hard pan at a depth of 60 to 150 cm (Colombo, Kalutara, Galle, Matara, Ratnapura and parts of Kegalle etc). These soils are poor in fertility. In contrast, the soils in the intermediate zone receiving an annual rainfall of 1300 - 1900 mm, has relatively fertile deep loamy soils in parts of Chilaw, Kurunegala and Kegalle districts. However, some parts of the intermediate zone has coarse sandy and lateritic soils which are poor in fertility.

## Importance of fertilizer

Long term field experiments and other investigations carried out by the Coconut Research Institute have revealed that the majority of coconut soils are deficient in essential plant nutrients; viz. nitrogen (N), phosphorus (P), potassium (K) and magnesium (Mg). Experiments have also shown that palms growing not only on poor soils but also on fertile soils response strikingly to applied fertilizer.

The requirement of nitrogen, potassium and phosphorus are supplied through NPK fertili-

zer mixtures. Magnesium can be supplied by either dolomite or kieserite. In addition to NPK fertilizers, magnesium fertilizers have to be applied to coconut to obtain the optimum

benefit from fertilizer use. The influence of NPK fertilizer on flowering of young palms and yield of adult palms is given in tables 1-3.

Table 1. Influence of NPK fertilizer on flowering of young palms

Site	Fertility status of the land	Time after transplanting (years)	Percentage of palms flowered	
			with NPK fertilizer	without fertilizer
Pothukulama Estate, Pallama	Rich	5	75	30
Ratmalagara Estate, Madampe	Rich	8	90	50

Table 2. Influence of NPK fertilizer on nut yield

Site	Fertility status	Time after transplanting (years)	Nuts/palm/year	
			with NPK fertilizer	without any fertilizer
Ratmalagara Estate, Madampe	Rich	17	105	48
Letchemy Estate, Walahapitiya	Poor	15	62	30

Table 3. Influence of NPK fertilizer on copra yield

Location	Fertility status	Mean yield of copra;kg/palm/yr.		Percent Increase
		No. fertilizer	NPK fertilizer	
Ahangama	Poor	3.15	7.91	150
Veyangoda	Poor	1.69	4.38	160
Bingiriya	Rich	13.76	16.70	20
Bandirippuwa	Rich	9.76	14.03	40

Based on the experimental evidence and other investigations, it is obvious that the application of NPK fertilizer brings about the following benefits:

- (i) Early flowering in young palms
- (ii) Improved growth of the palm
- (iii) High nut production per palm
- (iv) High copra yield per palm
- (v) Continuous high nut production throughout its lifetime

Magnesium is also very important for satisfactory yield. Magnesium deficiency can reduce the nut yield considerably. This deficiency can limit nut production even before yellowing manifests in the palm. The importance of magnesium is demonstrated below:

Condition and treatment	Yield at 7th year (nuts/palm/year)
(a) Palms with yellowing fronds + NPK fertilizer	20
Palms with yellowing fronds + NPK fertilizer + Magnesium	46
(b) Palms with green fronds + NPK fertilizer	46
Palms with green fronds + NPK fertilizer + Magnesium	62

This experiment clearly showed that the yield of palms with green fronds (palms without magnesium deficiency symptoms) should be increased by 35% by the application of magnesium fertilizer in addition to NPK fertilizers.

#### Present fertilizer recommendations

Based on long term field experiments and other investigations, the Coconut Research

Institute recently revised the fertilizer recommendations and introduced two NPK fertilizer mixtures for coconut; the young Palm Mixture (YPM) for seedlings and immature palms and the Adult Palm Mixture (APM) for bearing palms. In addition dolomite is recommended as a long term prophylactic measure against magnesium deficiency of palms.

APM and YPM are inorganic fertilizers and are prepared by mixing individual mineral components each contributing nitrogen, phosphorus and potassium to the mixture. These chemicals have a high nutrient content, and therefore, a fertilizer dose of 2.0 - 3.0 kg of APM is sufficient to supply the annual nutrient requirement of a palm.

Animal excreta such as goat dung or cow dung contain a considerable amount of plant nutrients and can be used for manuring coconut palms as an alternative to APM or YPM. They are commonly known as organic manures. The use of organic manure is advantageous in certain ways. Inorganic fertilizers provide only plant nutrients to the soil. On the other hand, in addition to supplying plant nutrient, the organic manure improve the soil structure, increase the water holding and nut-

rient retention capacities of the soil and enhance soil microbial activity. All these factors help to improve the growth of the palm and its nut production.

Unfortunately there are some problems in the use of organic manure as a nutrient source for coconut. Compared to inorganic fertilizers, the nutrient content of organic manure is very low and therefore they have to be applied in bulk. Although organic manures contain nitrogen, phosphorus and potassium, these are not in the proportion required for the plants. Therefore, they should be supplemented with inorganic fertilizers to meet the nutritional requirements of the palm. The cost of application of organic manure may also be higher. However, when freely available, their use is recommended.

### Use of inorganic fertilizer for coconut

#### 1. Inorganic Fertilizer Sources

- |                             |  |
|-----------------------------|--|
| (a) Nitrogenous fertilizer: | Urea; contains 46% nitrogen  |
| (b) Phosphatic fertilizers: | Saphos phosphate; contains 27.5% phosphorus pentoxide                                      |
| (c) Potassium fertilizer :  | Muriate of potash, contains 60% potassium oxide  |
| (d) Magnesium fertilizers:  | (i) Dolomite; contains 20% magnesium oxide<br>(ii) Kieserite; contains 24% Magnesium oxide |

2. Fertilizer Mixtures: The APM and YPM mixtures are given in Table 4.

Table 4. APM and YPM mixtures

Mixture	Parts by weight			%N	%P <sub>2</sub> O <sub>5</sub>	%K <sub>2</sub> O
	Urea	Saphos phosphate	Muriate of potash			
YPM	2	3	2	13	12	17
APM	4	3	8	12	6	32

The correct amount of each ingredient must be mixed thoroughly before use. However, prepared mixtures are available in the market.

#### 3. Rates and frequency of application

##### (a) Basal dressing at planting hole

The top soil used for filling each planting hole should be mixed with 1 kg of dolomite and 1 kg of YPM. In addition to this, 10 kg of dry cow dung or 4 kg of goat dung per planting hole would be beneficial.

##### (b) Seedlings and young palms

In addition to YPM application, 1.5 kg of dolomite per palm should be applied at the 3rd and 6th year. The radius of the manure circle indicates the distance upto which the

Table 5. YPM dose and size of manure circle for manuring young palms

Time after transplant	YPM (grams)	Radius of the manure circle	
		ft.	meter
6 months	500	1	0.3
1 year	600	1	0.3
1½ years	600	1	0.3
2 years	800	2	0.6
2½ years	800	2	0.6
3 years	1000	3	0.9
3½ years	1000	3	0.9
4 years	1200	4	1.2
4½ years	1200	4	1.2
5 years upto bearing	1200 every six months	5	1.5

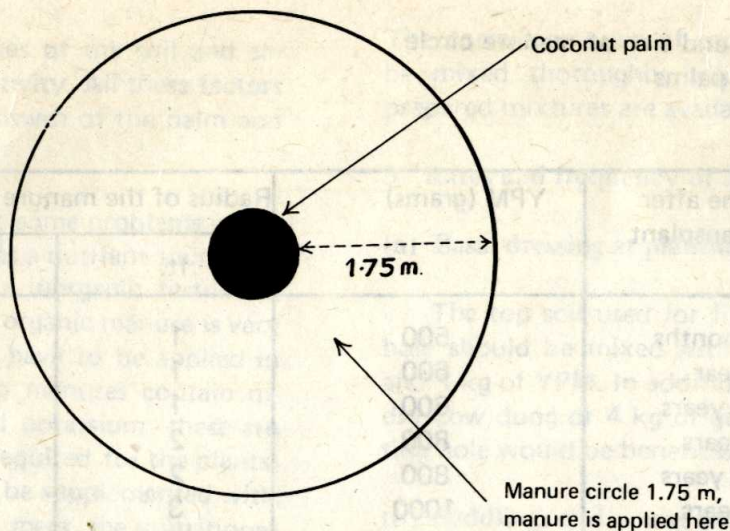
fertilizer should be broadcast from the base of the palm. Fertilizer should be applied in a full circle round the palm and incorporated into the soil by digging with a mamoty. Afterwards, the fertilized area should be mulched with dried plant debris. Application of YPM should be stopped when the palms start bearing. APM (Adult Palm Mixture) should be used in bearing palms.

(c) Adult palms (Bearing palms)

The Adult Palm Mixture (APM) is applied to bearing palms once a year. In areas where both monsoons prevail, and particularly on sandy soils, half yearly application with each monsoon may be adopted with advantage. The rate of application should be decided according to the soil type and climate of the area.

Table 6. Rate and frequency of application of APM and dolomite to bearing palms

Climate zone	Soil type	APM kg/palm annually	Dolomite kg/palm once in 3 years
Wet Zone	Gravel/cabook/sand	3.0	2.0
	Loam/clay	2.0	2.0
Intermediate Zone	Gravel/cabook/sand	3.0	1.5
	Loam/clay	2.0	1.5
Dry Zone	Gravel	3.0	1.5
	Loam or clay	2.0	1.5
	Sand	2.5	1.5



Fertilizer should be broadcast in the entire area of the soil surface from the base upto 1.75 m as illustrated in diagram 1. The fertilizer is incorporated into the soil by digging with a mamoty. Afterwards, the fertilized area should be mulched with dried plant debris. Upto 1½ times the recommended doses should be applied to improved cultivars (CRIC 60 and CRIC 65), high yielding blocks or blocks with a potential for high yield.

Dolomite can be applied to the palm together with either APM or YPM. Dolomite and APM or YPM should be broadcast onto the manure circle one after the other and incorporated into the soil. It should be emphasised that mixing dolomite with APM or YPM is not required at all.

#### Use of organic manure for coconut

##### 1. Organic manure

Some commonly available organic sources that can be used as manure for coconut and their plant nutrient contents are given below:

##### 2. Organic manure for seedlings and young palms

Organic manure, appropriately supplemented with saphos phosphate and muriate of potash, can be used for seedlings and young palms instead of YPM.

Unlike in the application of YPM, organic manure should be applied only once a year. The size of the manure circle is the same as for YPM application (Table 5). In addition to organic manure, 1.5 kg of dolomite should be applied to each palm once in three years to meet the magnesium requirements of the palm.

In young palms (upto one year) organic manures should be broadcast upto a distance of 0.3 meters (1') from the base and incroporated. As the palm grows this area should be gradually extended upto about 1.5 cm (5').

Material	% Moisture	% Nitrogen (N)	% Phosphours pentoxide ( $P_2O_5$ )	% Potassium oxide ( $K_2O$ )
Cattle dung(dry)	8-12	0.7-1.5	0.7-1.4	0.6-1.1
Cattle dung (fresh)	45-55	0.4-0.8	0.2-0.4	0.3-0.6
Goat dung	10-15	2.0-3.0	0.4-0.7	1.0-1.5
Poultry droppings	30-60	1.0-1.5	0.8-1.0	1.0-1.5

Table 7. Application of organic manure to seedlings and Young Palms.

1. Dried cattle manure	6 kg	15 kg	20 kg	25 kg	30 kg
Saphos phosphate	100 g	250 g	300 g	400 g	500 g
Muriate of potash	50 g	150 g	200 g	250 g	300 g
or					
Goat manure	3 g	6 kg	8 kg	10 kg	13 kg
Saphos phosphate	150 g	400 g	500 g	650 g	800 g
Muriate of potash	100 g	200 g	300 g	350 g	400 g
or					
Poultry droppings	5 kg	13 kg	17 kg	20 kg	25 kg
Saphos phosphate	50 g	100 g	150 g	125 g	200 g
Muriate of potash	25 g	75 g	100 g	100 g	150 g

### 3. Organic manure for adult palms

The appropriate annual requirement of manures for blocks yielding around 3000 nuts per acre per year is given in Table 8.

Upto 1½ times the rates given in Table 8 may be applied to improved cultivars (CRIC 60 or CRIC 65), high yielding blocks or blocks with a potential for high yield. In addition to organic manure, dolomite should be applied as recommended in table 6.

In adult palms, organic manure should be applied in trench to facilitate decomposition. This trench should be about 1 meter (3') wide and 15 cm (6") deep, cut around the palm about 1 meter (3') away from the base. The supplementary inorganic fertilizers are added and mixed and the trench is closed. The area fertilized should be covered with plant debris. Organic manure application is done only once a year.

**(a) Dried cattle manure**

Agroclimatic zone and soil type	Dried cattle manure	Saphos phosphate	Muriate of potash	Material	
<b>i. Wet/Intermediate Zone</b>					
Gravel or sandy soil ..	35 kg	500 g	1200 g	Cattle dung (fresh) Goat dung Poultry droppings	
Loam or clay soil ..	25 kg	350 g	800 g		
<b>ii. Dry Zone</b>					
Gravel soil ..	35 kg	500 g	1200 g		
Loam or clay soil ..	25 kg	350 g	800 g		
Sandy soil ..	30 kg	400 g	1000 g		

**(b) Goat manure**

Agroclimatic zone and soil type	Goat manure	Saphos phosphate	Muriate of potash
<b>i. Wet/Intermediate Zone</b>			
Gravel or sandy soil ..	15 kg	850 g	1300 g
Loam or clay soil ..	10 kg	500 g	850 g
<b>ii. Dry Zone</b>			
Gravel soil ..	15 kg	850 g	1300 g
Loam or clay soil ..	10 kg	500 g	850 g
Sandy soil ..	12 kg	700 g	1000 g

**(c) Poultry droppings**

Agroclimatic zone and soil type	Poultry dropping	Saphos phosphate	Muriate of potash
<b>i. Wet/Intermediate Zone</b>			
Gravel or sandy soil ..	30 kg	150 g	1000 g
Loam or clay soil ..	20 kg	100 g	650 g
<b>ii. Dry Zone</b>			
Gravel soil ..	30 kg	150 g	1000 g
Loam or clay soil ..	20 kg	100 g	650 g
Sandy soil ..	25 kg	150 g	850 g

**Time of application of fertilizer**

Fertilizer should be applied during the rainy season when the soil is moist. On light sandy soils and on lands which tend to get water logged, fertilizer application should be done after the heavy rains are over..