



Coconut Research Institute of Sri Lanka



Advisory Circular No A 5

INORGANIC FERTILIZER APPLICATION FOR COCONUT

1. Introduction

The coconut palm at a production level of 50 nuts per year removes the following approximate rates of major plant nutrients.

Nitrogen	- 480 g (Urea equivalent of 1.0 kg)
Phosphorus	- 55 g (Eppawela Rock Phosphate equivalent of 420 g)
Potassium	- 900 g (Muriate of potash equivalent of 1.8 kg)
Magnesium	- 180 g (Dolomite equivalent of 1.5 kg)

In addition to the removal by palms, soil nutrients can be lost by run off, leaching erosion, and uptake by weeds etc.

The above processes lead to depletion of essential plant nutrients in the soil, which cause a gradual decline of nut yield. Therefore, soils in coconut plantations should be enriched with nitrogen, phosphorus, potassium and magnesium by regular fertilizer application. Coconut palms can be manured with either inorganic fertilizer or organic manures. This document presents complete detail on inorganic fertilizer application for coconut.

The nutrient requirement of young coconut palms (before flowering) is different from that of adult coconut palms (after flowering). Separate fertilizer recommendations are made for young palms and bearing palms.

Two sources of phosphate fertilizers, namely Eppawela Rock Phosphate (ERP) and Imported Rock Phosphate (IRP) are recommended for coconut palms. ERP is recommended only for the wet and intermediate zones because its soluble phosphate fraction in 2% citric acid is low (4% P_2O_5) and dissolution rate is very slow in neutral soils in the Dry zone. The Imported Rock Phosphate with a soluble phosphate fraction in 2% citric acid of (8% P_2O_5) is recommended for the Dry zone. Its dissolution rate in neutral soils is higher than that of ERP.

A map of Sri Lanka showing boundaries of wet, intermediate and dry zones are shown in picture 1.



Picture 1: A map Sri Lanka showing boundaries of wet, intermediate and dry zones

2. Straight fertilizers

Following are the straight fertilizers and their percentage availability of nutrients used for coconut cultivation.

Fertilizer	Percentage of nutrient
Urea	46% N
Eppawela Rock Phosphate	30% P ₂ O ₅ (total)
Imported Rock Phosphate	28% P ₂ O ₅ (total)
Muriate of potash	60% K ₂ O
Dolomite	20% MgO

Furthermore, 2% citric acid soluble P₂O₅ contents in Eppawela Rock Phosphate and Imported Rock Phosphate should be more than 4% and 8% respectively.

Following are the recommendations for application of straight fertilizers to the coconut palm at planting, young and bearing stages.

2.1 Basal dressing per planting hole at the time of planting

Wet and intermediate zones		Dry zone	
Fertilizer	Amount (g)	Fertilizer	Amount (g)
Urea	250	Urea	250
Eppawela Rock Phosphate	750	Imported Rock Phosphate	500
Muriate of potash	250	Muriate of potash	250
Dolomite	1000	Dolomite	1000

In addition to the inorganic fertilizer recommended above, application of 10 kg of dry cattle manure or goat manure or seasoned poultry manure per planting hole would be beneficial.

2.2 Young palms

Requirements per palm (g) based on the age

Wet and intermediate zones	Age of palm							
	6 months	1 year	1½ year	2 year	2½ year	3 year	3½ year	4 year up to bearing
Fertilizer (g)								
Urea	190	235	235	305	305	375	375	470
Eppawela Rock Phosphate	420	530	530	690	690	850	850	1060
Muriate of potash	190	235	235	305	305	375	375	470
Dolomite	500	500	500	500	500	500	500	500

Dry Zone	Age of palm							
	6 months	1 year	1½ year	2 year	2½ year	3 year	3½ year	4 year up to bearing
Fertilizer (g)								
Urea	190	235	235	305	305	375	375	470
Imported Rock Phosphate	270	330	330	490	490	600	600	660
Muriate of potash	190	235	235	305	305	375	375	470
Dolomite	500	500	500	500	500	500	500	500

2.3 Adult palms

Fertilizer (g)	Wet and Intermediate Zones	Dry Zone
Urea	800	800
Eppawela Rock Phosphate	900	-
Imported Rock Phosphate	-	600
Muriate of Potash	1600	1600
Dolomite	1000	1000

2.4 Improved cultivars (CRIC 60, CRIC 65 and CRISL 98) and high yielding palms

For hybrid coconuts, improved cultivars and high yielding palms (more than 75 nuts/palm/yr), application of 1 ½ times the above rates is recommended.

2.5 King coconut palms

Fertilizer recommendation to king coconut is the same as that given in sections 2.1, 2.2 and 2.3.

3. Fertilizer mixtures

3.1 NPK Fertilizer mixtures for Coconut

3.1.1 Fertilizer mixture for basal dressings, seedlings and young palms

(a) Young Palm Mixture for the wet and the intermediate zones (YPM-W)

Urea	2.0 parts by weight
Eppawela Rock Phosphate	4.5 parts by weight
Muriate of Potash	2.0 parts by weight

NPK composition of the mixture
 11% N, 16% P₂O₅, 14% K₂O (11-16-14)

(b) Young Palm Mixture for the dry zone (YPM D)

Urea	2 parts by weight
Imported Rock Phosphate	3 parts by weight
Muriate of Potash	2 parts by weight

NPK composition of the mixture
13% N, 12% P₂O₅, 17% K₂O (13-12-17)

3.1.2 Fertilizer mixtures for adult palms

(a) Adult Palm Mixture for the Wet and the Intermediate zones - APM-W

Urea	8 parts by weight
Eppawela Rock Phosphate	9 parts by weight
Muriate of Potash	16 parts by weight

NPK composition of the mixture
11% N, 8% P₂O₅, 29% K₂O (11-8-29)

(b) Adult Palm Mixture for the Dry zone - APM -D

Urea	8 parts by weight
Imported Rock phosphate	6 parts by weight
Muriate of Potash	16 parts by weight

NPK composition of the mixture
12% N, 6% P₂O₅, 32% K₂O (12-6-32)

3.2 NPK Mixtures for King Coconut Palms

Fertilizer mixtures recommended for the king coconut palms are the same as those given in the section 3.1.

Note :

- The APM fertilizers become moist when it is exposed to air, because its urea component absorbs moisture from the atmosphere. When the mixture is wet, it can not be either stored or applied to the soil.
- APM should be applied when the soil surface is wet for minimizing the ammonia emission from urea.
- Although dolomite should be applied to the coconut palm as a magnesium fertilizer, it is not included in the APM because urea and dolomite should not be mixed and stored. However, it is not necessary to have a time gap between APM and dolomite application. APM and dolomite may be broadcast on the manure circle and incorporated with the soil.

4. Application Rates of Fertilizer Mixtures

4.1 Basal dressing at planting

For each planting hole, the topsoil used for filling should be mixed with the following.

For wet and intermediate zone

YPM - W	1250 g
Dolomite	1000 g

For dry zone

YPM D	1000 g
Dolomite	1000 g

In addition to the inorganic fertilizer recommended above, application of one of the organic manures such as dry cattle manure, goat manure, seasoned poultry manure in 10 kg per planting hole would be beneficial.

4.2 Application rate for Young Palms: Young Palm Mixture YPM-W and YPM-D

Age of seedlings	Rate of application g/palm/6 month		
	YPM-W Wet/Intermediate zoned	YPM-D (Dry zone)	Dolomite
6 months	800	650	500
12 months (1 year)	1000	800	500
18 months (1 1/2 years)	1000	800	500
24 months (2 years)	1300	1100	500
30 months (2 1/2 years)	1300	1100	500
36 months (3 years)	1600	1350	500
42 months (3 1/2 years)	1600	1350	500
48 months (4 years) up to bearing	2000	1600	500

4.3 Rate of application for Adult Palms

NPK Adult Palm Mixture APM-W, APM-D and dolomite

Rate of application kg/palm/yr		
APM-W(Wet & intermediate zones)	APM-D (Dry zone)	Dolomite
3.3	3.0	1.0

The above-recommended dosage should be applied for palms yielding 50-75 nuts per palm per year. For hybrid coconut, improved cultivars and high yielding palms (more than 75 nuts/palm/yr) application of 1.5 times the above rates is recommended.

4.4 King coconut

Recommendations for king coconut are the same as given in section 4.1, 4.2 and 4.3.

5. Method of fertilizer application

5.1 Young palms

In the early stage (upto 1-1½ years) fertilizers should be broadcast close to the palm covering the entire circle (manure circle) upto a distance of 30 cm (about 1') from its base, and incorporated. As the palm grows older, this area should be gradually extended (30 cm per year) upto about 1.5 m at the time of flowering (See the table given below). Apply a mulch immediately after fertilizer application (Refer 5.3). All the above steps should be followed to obtain the full benefit of the fertilizer application.

Ago of the seedlings (Months)	Radius of the manure circle (cm)
6	30
12	60
18	60
24	90
30	90
36	110
42	110
48	150

5.2 Bearing palms

Fertilizer should be broadcast in the entire area of the soil surface around the base of the palm up to a distance of 1.75 meters (about 6') from the base. This area is referred to as the manure circle (Picture 2, 3 and 4). Weeds in the manure circle should be slashed or remove the mulch before fertilizer application (avoid clean weeding

with a mamoty). The fertilizer should then be dug over into the soil. Cover the manure circle with a mulch (Refer 5.3). All the above steps should be followed to obtain the full benefit of the fertilizer application.

5.3 Mulching

Immediately after fertilizer application, the manure circle should be completely covered with the materials such as weed trash, dried fronds or husks (Picture 5). Mulch helps to suppress ammonia emission due to decomposition of urea, weed growth and conserve soil moisture in the manure circle. It also reduces soil temperature, prevents drying of the soil surface and increase organic matter content in the soil. If mulch is



Picture 2: Preparation of manure circle

not applied properly at the correct time (immediately after fertilizer application), the total benefit of fertilizer application cannot be obtained.



Picture 3: Broadcasting of fertilizer



Picture 4: Incorporation of fertilizer to soil

On very steep lands that are subjected to considerable surface run-off, fertilizer should be applied in a semi circular shallow basin (up to 10 cm depth) cut round the palm on the upper part of the slope. The diameters of the inner circle and the outer circle should be 0.5 m and 1.5 m respectively. After the fertilizer application in the basin it should be closed well and mulched.

6. Frequency of application

6.1 Young Palms

At least, half yearly application of fertilizer is recommended. When circumstances permit, split application may be adopted particularly for lands with sandy soils to minimize leaching of fertilizer due to heavy rainfall during monsoons. For split application, apply the half of the recommended dose given in Section 2.2.



Picture 5: Mulching of manure circle

6.2 Bearing Palms

Fertilizer application should be carried out annually. In areas where heavy rains are received during both monsoons and for lands with sandy soils, half yearly application with each monsoon may be adopted to minimize leaching losses. For half yearly application, apply half of the recommended doses given in Sections 2.3 and 2.4.

7. Differential Fertilizer Recommendation (DFR)

Leaf analysis is an efficient tool for diagnosing nutrient imbalances in coconut plantations. Under Differential Fertilizer Recommendation, diagnosis of nutrient imbalances is carried out by leaf analysis and fertilizers are recommended to correct deficiencies and luxury consumption of nutrients. This procedure has a distinct advantage of determining the most appropriate fertilizer dosage to the palm, avoiding excess use of fertilizer.

Please note that the request for the Differential Fertilizer Recommendation should be made at least 6 months after the last fertilizer application. The best months for taking leaf samples for DFR are January, February, June, July and August. Leaf samples for DFR cannot be taken during rainy season or within 6 months after fertilizer application.

Each grower can obtain a DFR service for his/her own land by making a request to the Soils and Plant Nutrition Division of Coconut Research Institute.

8. Fertilizer application for irrigating palms

If coconut palms are irrigated, it is advisable to apply the recommended fertilizer dose in split applications with the supply of water. The water soluble fertilizers such as Urea and White Muriate of Potash could be applied with water while insoluble fertilizers such as Eppawala Rock Phosphate, Imported Rock Phosphate and Dolomite are applied separately to the manure circle.