



**UNIVERSITI PUTRA MALAYSIA**

**THE EFFECT OF NITROGEN AND POTASSIUM  
FERTILIZERS AND SOIL TYPES ON RUBBER  
(HEVEA BRASILIENSIS MUELL. ARG.)**

**CHANG AH KOW**

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THE EFFECT OF NITROGEN AND POTASSIUM  
FERTILIZERS AND SOIL TYPES ON RUBBER  
(HEVEA BRASILIENSIS MUELL. ARG.)

By

CHANG AH KOW

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To  
Set Chin,  
Lee Ming,  
Lee Churn and  
Lee Yoon. .



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## LIST OF ABBREVIATIONS

ANOVA	Analysis of Variance
Approx	Approximate
CEC	Cation Exchange Capacity
CIRP	Christmas Island Rock Phosphate
C mol	Centi molar
DRC	Dry Rubber Content
FELDA	Federal Land Development Authority
GML	Ground Magnesium Limestone (Dolomite)
HMPB	Harrisons Malaysian Plantation Berhad
LCC	Leguminous Cover Crops
LSD	Least Significant Difference
MOP	Muriate of Potash (KCl)
Me %	Milliequivalent percent
OPRS	Oil Palm Research Station, Banting, Selangor
RISDA	Rubber Industry Smallholders Development Authority



RRIM	Rubber Research Institute of Malaysia (formerly Rubber Research Institute of Malaya)
SAS	Statistical Analysis Systems
Sg	Sungai
SIRIM	Standards and Industrial Research Institute of Malaysia
Yr	Year



## ABSTRACT

Abstract of thesis submitted to  
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THE EFFECT OF NITROGEN  
AND POTASSIUM FERTILIZERS AND SOIL TYPES  
ON RUBBER (HEVEA BRASILIENSIS MUELL. ARG.)

By

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November, 1989.

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Faculty : Agriculture

Five fertilizer trials were conducted from 1977 to 1987 to evaluate the effects of different rates of nitrogen (N) and potassium (K) fertilizers on rubber grown on five types of soils in Peninsular Malaysia. The treatments consisted of one control (unfertilized) and nine factorial combinations of nitrogen and potassium fertilizers at three levels each. The levels



of fertilizers used were 26.4 kg, 53.3 kg and 79.7 kg N  $\text{ha}^{-1} \text{yr}^{-1}$  in combination with 26.0 kg, 60.3 kg and 97.1 kg K  $\text{ha}^{-1} \text{yr}^{-1}$ . The rubber clone used in these trials was RRIM 600. The five types of soils used were Sitiawan series (Aquoxic Tropudult), Rasau series (Oxic Dystropept), Durian series (Orthoxic Tropudult), Malacca series (Tropeptic Haplorthox) and Munchong series (Tropeptic Haplorthox).

Data on growth, yield and leaf nutrient levels were recorded throughout the course of the trials. Soil analyses were undertaken at the beginning and at the end of the trials.

Soil analyses indicated that there was an increase in the organic carbon, total nitrogen and phosphorus contents in the soil. The higher organic carbon reflects the build-up of organic matter from the residue of the leguminous cover crops and leaf litter. The higher total N and P could be the result of the accumulation of N and P from the organic matter decomposition and perhaps from the fertilizer application.

Generally, there were slight decreases in exchangeable bases in some soils, indicating the



utilisation of these nutrients by the plants in excess of the fertilizer given. However, this observation was inconsistent in two of the trials.

Positive growth and yield responses to N and K fertilizers were detected only after six years of fertilization. Better responses were obtained from the combinations involving the second and third levels of N and K fertilization. The best growth and yield were obtained from N and K fertilization at the rate of 53.3 kg N and 60.3 kg K per hectare per year.

The lack of responses in the first few years of the trials can be attributable to two main factors, i.e. the substantial recycling of nutrients by the vigorous leguminous cover crops established during the immature phase and the fertilizer poaching by the extensive and intermingling root systems of the rubber trees. Based on the physical tracing of roots in situ, the longest root could exceed 7 m and studies by other researchers show that lateral roots could reach a horizontal distance of 11 m from the tree trunk.

Leaf nutrient contents were related to the inherent soil properties and were influenced to a slight extent by the respective fertilizer nutrients applied.



Rainfall could have some effect on growth and leaf nutrient content but the relationship could not be quantified. It appeared that both too little and too much rain were not conducive for high latex yields. The most favourable range of rainfall was from 1900 to 2100 mm per annum.

Overall, the results showed that high rates of fertilizers are necessary to sustain good growth and yield of rubber. These rates are higher than those applied under current practice.

A supplementary finding from the trials is that, in designing fertilizer trials involving small plots, adequate guard rows or trenching may be necessary in order to reduce fertilizer poaching by roots and to make the trials more sensitive to the fertilizer treatments.





## ABSTRAK

Abstrak tesis yang dikemukakan kepada Senat Universiti Pertanian Malaysia sebagai memenuhi sebahagian daripada syarat-syarat untuk Ijazah Master Sains Pertanian

KESAN PEMBAJAAN NITROGEN DAN KALIUM DAN  
JENIS JENIS TANAH KE ATAS TANAMAN GETAH  
(HEVEA BRASILIENSIS MUELL. ARG.)

Oleh

CHANG AH KOW

November, 1989

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Fakulti : Pertanian

Lima kajian pembajaan telah dijalankan bagi menilai kesan kadar pembajaan nitrogen (N) dan kalium (K) ke atas getah yang ditanam di atas lima jenis tanah di Semenanjung Malaysia. Rawatan terdiri dari satu kawalan (tiada pembajaan) dan sembilan kombinasi faktorial baja N dan K pada tiga kadar tiap-tiap satu. Kadar N yang digunakan adalah 26.4 kg, 53.3 kg dan 79.7 kg N ha<sup>-1</sup> dan kadar K pula adalah 26.0 kg, 60.3 kg dan 97.1

