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**Responses of 10-year-old cacao trees (*Theobroma cacao* L.)  
to thinning, fertilizer and climatic conditions**

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DEDICATION

To my dear mother

Whose love, care, attention

and sacrifices keep me going

To my brothers and sisters.

To the people of my Country.

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## RESUMEN

Cinco tratamientos de raleo fueron probados en cuatro híbridos de cacao de diez años de edad (clones de UF x Amazonico), ubicados en la "zona atlántica" de Costa Rica. Dos niveles de fertilización (1500 kg/ha y 2250 kg/ha) fueron superpuestos sobre los tratamientos de raleo. El diseño fue de parcelas divididas.

La investigación fue llevada a cabo en la finca "La Lola" que está dividida en secciones. El experimento se realizó en dos de ellas, con distanciamientos del cacao de 2 x 2 m y 2 x 3 m, respectivamente.

Las respuestas a los tratamientos fueron evaluadas por medidas de rendimiento, diámetro del tronco a 0.3 m del suelo, altura de la horqueta, peso fresco de los chupones, número de chupones producidos e incidencia de infección por *Phytophthora*.

El rendimiento fue tomado cada dos semanas, mientras que las características vegetativas fueron evaluadas a intervalos variables de tiempo (en el caso del peso fresco de chupones y el número de chupones, era cada tres meses)

En la sección seis, el raleo de 50 por ciento de los árboles débiles produjo el mejor rendimiento, mientras en la sección ocho la evidencia indica que fue mejor el no raleo.

En general, el uso del nivel más bajo de fertilización tuvo el mejor resultado en cuanto a rendimiento de cacao húmedo.

Las parcelas con menores densidades de árboles produjeron más rendimiento por árbol. Esto ocurrió tanto en la sección seis como en la

sección ocho. En relación a los incrementos en diámetro y la producción de chupon, las parcelas con menores densidades de árboles tuvieron un comportamiento mejor. Este fue el caso en las dos secciones.

Los tratamientos con menores densidades de plantas tuvieron menos mazorcas perdidas debido a infección por *Phytophthora*. También el nivel de rendimiento tuvo mayor efecto que la humedad relativa sobre la pérdida de mazorcas por *Phytophthora*, en los tratamientos con mayores densidades de plantas.

Varias correlaciones fueron observadas. El diámetro del tronco a 0,3 m del suelo y el rendimiento arrojaron un valor de coeficiente de correlación positiva y altamente significativo. Varias ilustraciones gráficas están dadas para algunas de las correlaciones que existen entre las variables medidas. También se dan los coeficientes de correlación de las variables medidas, comparadas entre sí.

## SUMMARY

Five thinning treatments were tested on four different 10-year old cacao hybrids (UF x amazonic clones) situated at a farm in the "atlantic zone" of Costa Rica. Super-imposed on the thinning treatments were two levels of fertilizer application, 1,500 kg/ha and 2,250 kg/ha of 18:10:6:5 respectively. The statistical design was split-plot.

The original planting distance was 2 x 2 m in section six and 2 x 3 m in section eight. The experiment was carried out in both section six and section eight.

Responses to the treatments were made based on yield of wet cacao, tree-girth at 0.3 m from the soil, jorquette-height, fresh weight of chupon, the number of chupons produced and the incidence of *Phytophthora* infection, principally.

Yield of cacao was evaluated fortnightly while the vegetative features were taken at certain time intervals (three months in the case of chupon number and fresh weight of chupon).

In section six, thinning out of 50 per cent of the weak trees produced the greatest yield, while in section eight the indication is that it is best not to practice thinning at all. Generally the lower level of fertilizer application (1,500 kg/ha) was more beneficial to the yield of cacao/ha.

On an individual tree basis, the plots with lesser stand densities, produced more cacao. This was the case for both section six, as well as section eight. As regards the trunk-diameter increase and

the production of chupon the less dense plots also did better, on a per tree basis, than the more densely populated stands in both sections six and eight.

The treatments with the lesser plant densities had the smaller number of 'pod lost' per unit area, due to infections by *Phytophthora*. Also, the level of yield was more important than the humidity considerations in its effect on pod loss by *Phytophthora*, in the treatment with denser tree stands.

Various correlations were observed. Of note was the strong, positive correlation between tree-girth and yield. Various graphical illustrations are given of several of the correlations that exist between the variables measured. Also given are the correlation coefficients of the variables measured, compared between each other.

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