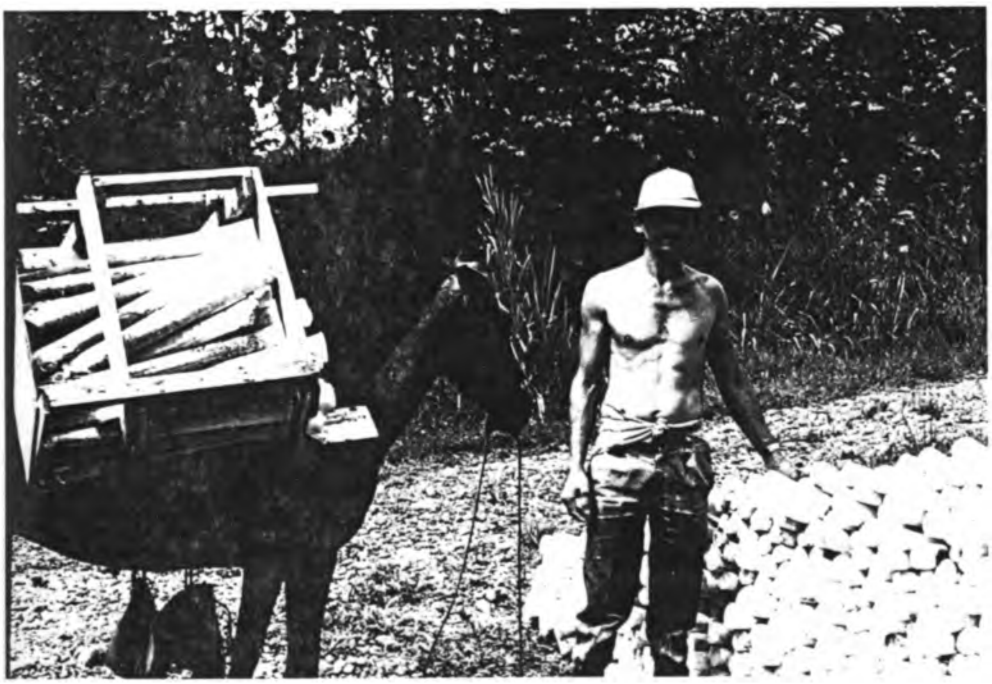
ATLANTIC ZONE PROGRAMME

Report No. 79
Field Report No. 126

N-P-K FERTILIZATION OF PALMITO

A study on N-P-K fertilization of *Bactris gasipaes* in the Atlantic Zone of Costa Rica



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CENTRO AGRONOMICO TROPICAL DE INVESTIGACION Y ENSEÑANZA - CATIE

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The Atlantic Zone Programme (CATIE-AUW-MAG) is the result of an agreement for technical cooperation between the Centro Agronómico Tropical de Investigación y Enseñanza (CATIE), the Agricultural University Wageningen (AUW). The Netherlands and the Ministerio de Agricultura y Ganadería (MAG) of Costa Rica. The Programme, that was started in April 1986, has a long-term objective multidisciplinary research aimed at rational use of the natural resources in the Atlantic Zone of Costa Rica with emphasis on the small landowner.

PREFACE

General description of the research programme on sustainable Landuse.

The research programme is based on the document "elaboration of the VF research programme in Costa Rica" prepared by the Working Group Costa Rica (WCR) in 1990. The document can be summarized as follows:
To develop a methodology to analyze ecologicaly sustainable and economically feasible land use, three hierarchical levels of analysis can be distinguished.
1. The Land Use System (LUS) analyses the relations between soil type and crops as well as technology and yield.
2. The Farm System (FS) analyses the decisions made at the farm household regarding the generation of income and on farm activities.
3. The Regional System (RS) analyses the agroecological and socio-economic boundary conditions and the incentives presented by development oriented activities.

Ecological aspects of the analysis comprise comparison of the effects of different crops and production techniques on the soil as ecological resource. For this comparision the chemical and physical qualities of the soil are examined as well as the polution by agrochemicals. Evaluation of the groundwater condition is included in the ecological approach. Criterions for sustainability have a relative character. The question of what is in time a more sustainable land use will be answered on the three different levels for three major soil groups and nine important land use types.

Combinations of crops and soils

	Maiz	Yuca	Platano	Piña	Palmito	Pasto	Forestal I II III
Soil I	x	x	x		x	x	x
Soil II						x	x
Soil III	x			x	x	x	x

As landuse is realized in the socio-economic context of the farm or region, feasibility criterions at corresponding levels are to be taken in consideration. MGP models on farm scale and regional scale are developed to evaluate the different ecological criterions in economical terms or visa-versa.

Different scenarios will be tested in close cooperation with the counter parts.

PREFACE

This report presents a thesis in palm heart. The work was done on the Atlantic Zone Project and on an experimental field at the plantation of Agropalmito near Guápiles, Costa Rica. This experiment was started in July 1991 by Raymond Jongschaap and was continued until the end of 1992. This report contains the results of the field and laboratory work done by Jorg-Johan Tõnjes in the period November 1991 until June 1992.

During the experiment four harvests have been done. This paper contains the results of the second harvest, which was done in April 1992.

The work was supervised by Ir. Don Jansen in Costa Rica and by Dr. Ir. Louise Fresco and Ir. Guiking from the Department of Tropical Crop Science from the Agricultural University Wageningen.

ACKNOWLEDGEMENT

During the field, lab and reporting work a helping hand was given by many people. First I would like to thank Agropalmito for the possibility to use their experimental field for the research. The people in the office were always very helpful and interested. Whenever I needed workers they provided them. The workers kept the field clean of weeds and helped with the fertilization.
During the field measurements of leaf growth Malberg was a great help. Malberg, Coco and Mario Solano have been working hard to harvest the plants and do the laboratory measurements. The spiny plants are hard to handle.
The last people I want thank are Raymond Jongschaap, Don Jansen, Louise Fresco and Theo Guiking. Raymond started the experiment and helped me to start the second research period. Don Jansen was a source of inspiration in the new aspect in the research: Leaf growth. Data collection and processing were discussed together. He also helped in the first steps of reporting. Louise Fresco and Theo Guiking supervised the last part of the reporting.
To everybody that made my stay in Costa Rica to a nice and fruitful period of my study:"¡Muchas gracias!"

SUMMARY

On the Atlantic Zone Programme in Guápiles research is done on the crops of the Atlantic Zone of Costa Rica. One of the crops in this zone is Bactris gasipaes (HBK). This palm tree is grown since ancient times for its fruits in Tropical America. When the palms are young they can be harvested for the 'palmito'. This is the content of the pseudostem. The palmito is an important cash crop for farmers in the zone. Often it is exported to the rich countries. Young palm trees are grown in rows on a field and develop sprouts on the pseudostem base. Only the palmito and two leaf sheats are exported from the field. Sprouts take over growth.

The reaction of the crop on N-P-K fertilizers is studied in this experiment. The production, the closing of the canopy and the development of sprouts is studied in a 3x3x2 N-P-K experiment in four replicates. Plants were harvested in four periods during 17 months. This report discusses the second harvest after 8.5 months. Measurements on plant height, leaf number, sprout number, leaf area of plants and sprouts and fresh and dry weights of leaves, sprouts, pseudostem, palmito and leaf petioles were done. The nutrient contents of all plant parts were determined too.

Leaf growth measurements were done in the field on plants of 4.5 to 7.5 months of age. An equation was made for leaf growth in this period for 8 treatments of N-P-K.

Significant nitrogen effects were found for diameter of the pseudostem, fresh weight of the palmito, the number of sprouts, the leaf area of the sprouts, the length of the pseudostem, plant height, the total dry weight of the plants, the P content of the petioles and the K uptake per hectare. A significant effect of P was found for the P content of the pseudostem and the petioles. K has a significant effect on the palmito fresh weight and the contents of K in the petioles, pseudostem, palmito and sprouts and the total K uptake per hectare. An interaction of NxP was found for the total length until the last petiole, total dry weight and total K uptake. NxP interaction was found for the contents of P in the leaf sheats and K in the sprouts. NxPxK interaction was found for the sprout number.

After statistical analysis of the leaf growth measurements it was concluded that the growth for all treatments can be written in one equation. More research on leaf growth over a longer period and using more treatments has to be done in the future.

A dose of 336 kg N and 360 kg K per hectare per year resulted in the highest palmito fresh weight. When combined with a P fertilization of 408 kg per ha per year the best continuity for palmito cultivation is found. Economically it may be advisable not to use fertilizer, but to avoid losses of nutrients specially in the first period after planting.

More research has to be done on the sustainable cultivation of this interesting crop. Economics and plant breeding have to be included in future research.

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1. INTRODUCTION

1.1 Introduction

In the humid tropics the sustainability of cropping systems is difficult to maintain. Because of heavy rainfall nutrients can leach quickly. The high temperatures cause a rapid mineralization of organic material (SOLLINS et al, 1986). A perennial can protect the soil against leaching. Good fertilization can help in maintaining the soil fertility and can keep production going.
Within the framework of the research of the Agricultural University of Wageningen on the crops of the Atlantic Zone of Costa Rica (figure 1.1.1) research is done on the sustainability of cropping systems.

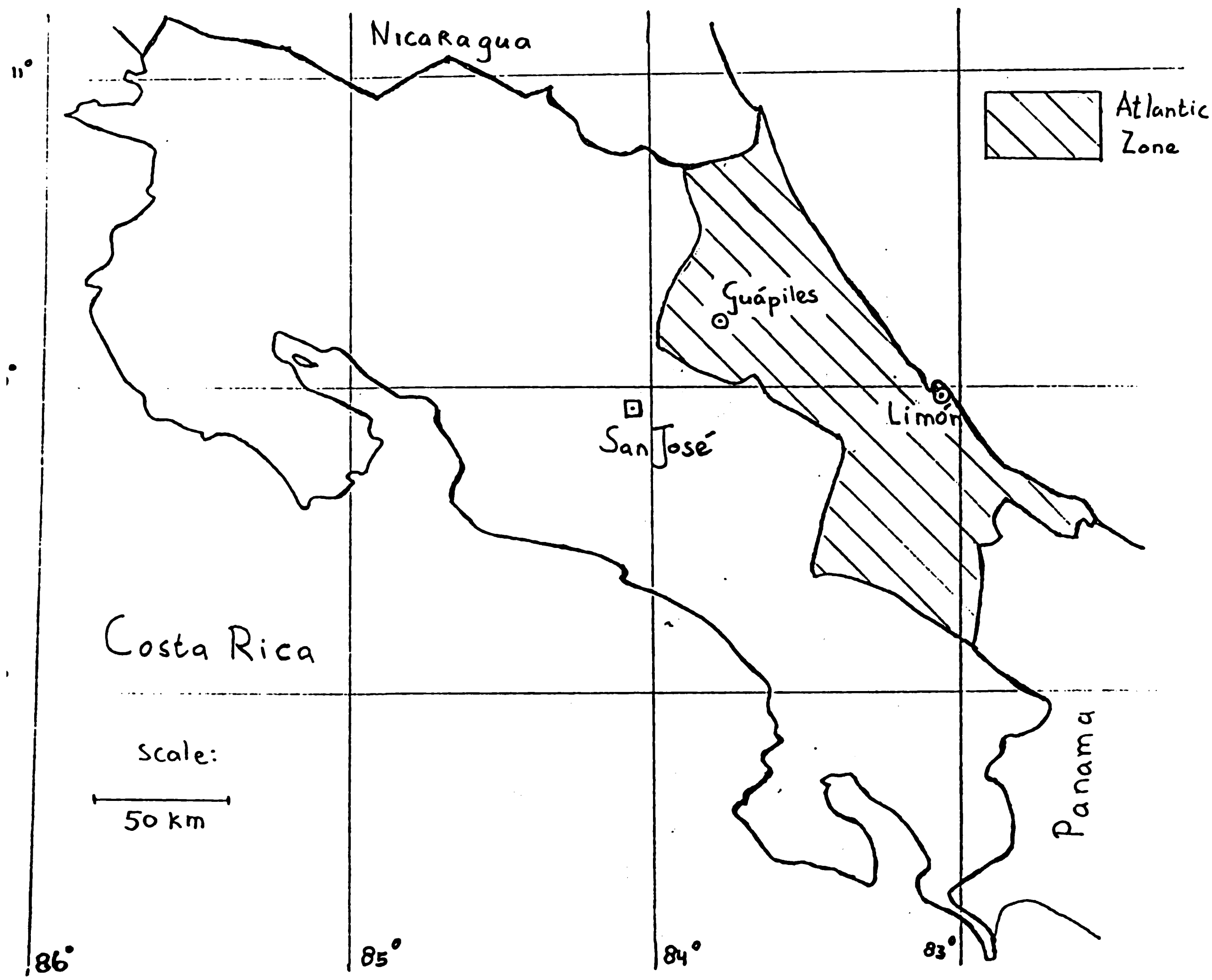


Fig 1.1.1: The Atlantic Zone of Costa Rica

Research is done to know more about the sustainability of the cropping system of palmito de pejibaye (Bactris gasipaes (HBK) under different fertilizing quantities of N, P and K.
It is important to know how many nutrients are removed from the field with the parts of the plants that are removed, because this also causes reduction of nutrients on the field.
Growth and soil fertility are connected to each other. Research had to be done on the uptake of nutrients by palmito and their distribution over the plant

under different fertilizing conditions.
In the Atlantic Zone an experiment was started to study the distribution of nutrients under 18 different N-P-K fertilizer treatments. Plants are harvested periodically and the nutrient contents in the different aerial parts are determined. The leaf area is also measured. In this way growth of the plant, total leaf area and uptake of nutrients can be compared.
Growth can be related to uptake of nutrients but also to morphological differences. The amount of leaf area may determine growth. The maximum dimension of a leaf may be sink dependent (genetically fixed), but it may also be source dependent (related to availability of nutrients and assimilates). In the first case, breeding for big leaves could be worthwhile, to stimulate early growth, whereas in the latter case, more emphasis should be on management in the early growth stages of palmito.
Leaf growth is an important process to study. Influences of fertilizer application (and nutrient uptake) on leaf growth need to be determined to contribute to a quantification of the effect of fertilizer application on growth.

1.2 Bactris gasipaes

Taxonomists are in disagreement about the taxonomic best name of the peach palm (LLERAS, 1986, LEÓN, 1987, ARIAS and CLEMENT, 1982). In this report the name Bactris gasipaes (HBK) will be used. The names Guilielma gasipaes (HBK) Bailey and G. utilis are also used in publications.
Bactris gasipaes is a caespitose, monoecious feather palm which has been cultivated since ancient times from sea level to 1200 meter in Central and South America (PURSEGLOVE 1985, CLEMENT 1988). It grows best from sea level to 800 meter. The species needs a high annual rainfall of 2000 to 10000 millimeters annually (optimum 3000-5000 mm), a warm climate (optimal temperatures 25° to 28°C), and well drained soils (ANONYMOUS 1983, ANONYMOUS 1986). It will grow well on acid soils. It is found from the Amazon Area, where it most probably has its origin, until Central America (LEON, 1987).
The peach palm can reach a height of maximal 20 meters and has got a stem diameter of 10 to 25 centimeters. Figure 1.2.1 shows a mature peach palm on a farm near Rio Frio.
The plant is armed with sharp spines on its stem, its petioles and its leaves. It develops suckers at the base of the stem. After minimal three years (normally 5-8) the first inflorescenses appear. The raceme has got bisexual flowers. It produces 10-120 fruits and weights 1.5-18 kilograms. Production can go on for 50-75 years. The fruits measure three to five centimeters. They are conical to ovoid, have a yellow to deep orange epicarp. The mealy mesocarp is an edible part. Fruits are cooked in salt water for about three hours. In this way the epicarp and the conical seed, that measures about 2 centimeters can easily be removed. The oily seed is also edible (LEON 1987, PURSEGLOVE 1985, ANONYMOUS 1985, CLEMENT 1988).

Fig 1.2.1: Mature peach palm on a farm near Rio Frio

Fig 1.2.2: Young palms for palmito production

The young palms (figure 1.2.2) can also be harvested entirely after 1.5-2.5 years to use the palm heart as a luxury vegetable. The pseudostem is cut and the white center, from which leaves develop, is extracted (ANONYMOUS, 1985).

1.3 Palmito cultivation

After the depletion of the natural palmito resources of the forests near the processing industry the cultivation was started. The area of palmito in cultivation is increasing at farms and plantations.
The seeds are sown in plastic bags or nursery beds and planted in the field after about three to six months when they have six leaves (ANONYMOUS, 1986). Planting distances of 1-1.5 meters in the rows and 2.5-3.5 between the rows usually are used (2000-4000 planting holes per hectare). During the growth of the plants suckers raise from the basis of the stem. These 'hijos' take over after cutting the mother plant at the harvest (MAG, 1983, BURGOS, 1977).
Still a great diversity in planting material exists. The ideotype of a pejibaye palm for palmito production is as follows (CLEMENT, 1988):

- Trunk diameter more than 18 centimeters
- Leaf rachis more than 2.5 meter
- Leaf area more than 3.0 meter
- High net assimilation rate
- High basal shoot production
- Spineless petioles
- Rapid growth, first cut at 1.5 year
- Rapid regrowth, second cut after one year
- Resistant to leaf mite
- Good flavor
- Yield more than 3.0 tons per hectare per year

Some insects can damage the palm. Publications mention Rhynchophorus palmarum, Metamasius hemipterus, Strategeus aloeus, and Retraerus johnstoni (MAG, 1983, MORA, 1983). Treatments with insecticides are mostly used. Also some diseases are caused by the fungi Graphium sp., Ceratocystis spp., Charolopsis sp., Monilia sp., Pestalotiopsis sp., Mycosphaerella sp., Colletotrichum spp., Erwinia sp., and Phytophthora sp.. Plants are usually treated with fungicides. At plantations spray planes are used. The damage caused by animals can be big. The 'taltuza' (Orthogeomys cherriei (Allen) Rodentia: Geomyidae) is a problem in plantations and on farms. These rats can damage the roots of the palmito plants. They feed on the roots of the plant. The best way to combat them is to catch them in traps (ANONYMOUS 1986, DELGADO 1990-1+2, MORA 1983).
Farmers and plantations apply fertilizer if they think the plant needs it or produces better with it. Advises for fertilization differ much. Nitrogen, phosphate, potassium, magnesium and sometimes spore elements are applied. More about this subject is written in paragraph 1.7.
At harvest time plants are cut near the ground. Leaves are cut and left on the field with the leaf sheaths. The palmito 'candle' with two last leaf sheaths is exported from the field. In this condition the palmito has to be eaten or processed within two days.

1.4 Use of heart of palm

The palmito can be used in many ways after the harvest. It tastes good in salads and cooling drinks and is also a delicatessen cooked or fried with spices and vegetables or in soups. It can be used to make alcoholic drinks. It can be toasted too. The processing industry cans it in salt, acid, vinegar or with spices. (MORA 1987)
Palm heart is exported by Brazil, Paraguay, Venezuela, the Philippines and Costa Rica and some more small exporting countries to the United States of America, Canada, France and other European countries (ANONYMOUS, 1985). The market is growing still. There it is used as a 'specialité du chef'. In the producing countries it is often used at special occasions like weddings or Christian holy days.

1.5 Palmito in the Atlantic Zone of Costa Rica

The cultivation of palmito in the Atlantic Zone is still increasing. Plantations are expanding and many farmers start to plant or plant more. Prices of palmito were high compared to other crops in July 1992, but due to the higher supply they are getting lower. Some companies buy palmito. Most of them are exporting the product after canning and only few are processing the palmito for the local market. The location of Costa Rica near the United States and Canada (the most important importing countries) and the harbor of Limón can contribute to a good position on the world market of palmito. At this moment Brazil is biggest exporter of palmito. Costa Rica has got the most knowledge about the pejibaye palm and uses the most advanced cropping systems in this crop in the world. Brazil is starting to cultivate palmito. There palmito was extracted out of the forests of the Amazon (ANONYMOUS 1985).

1.6 Palmito in the Atlantic Zone Programme

The Atlantic Zone Programme is a result of an agreement for technical cooperation between the Centro Agronómico Tropical de Investigación y Enseñanza (CATIE, Turrialba), the Ministerio de Agricultura y Ganadería of Costa Rica (MAG) and the Agricultural University of Wageningen, The Netherlands. The program was started in 1986. It has as long-term objective multidisciplinary research aimed at rational use of the natural resources in the Atlantic Zone of Costa Rica with emphasis on the small landowner.
In its cropping systems research the program concentrates on some crops, which are selected on the basis of their typical occurrence in the study region and the perspectives for future development (ATLANTIC ZONE PROGRAMME, 1992). This report is about a study on the level of the Land Use System (LUS), which analyses the relations between soil type and crops as well as technology and yield. The programme also studies the Farm System and the Regional System levels.
The information the program collected from 1987-1990 formes the basis of the work plan for the second phase: A methology for analysis and planning of sustainable land use. In this report the maintenance of production and soil fertility are subject of research.

1.7 Palmito and fertilizers

Some research is done on the subject of palmito fertilization. In experiments reactions on nitrogen and phosphorous fertilization often are described. Sometimes other elements are added to the crop. Gúzman (1985) describes an experiment with N-P-K fertilization. Interactions are left out in all experiments. An experiment which includes possible interactions may give a better fertilization advice.

1.8 Objectives and hypotheses

In this report an effort is made to quantify the flows of nutrients that were mentioned:

- The uptake rate of nutrients in relation to fertilizer application.
- The relation of dry matter growth to uptake of nutrients.
- The relation of leaf area development to growth and nutrient application.

The hypotheses of this study are:

- There is a positive relation between N-P-K fertilizer application and N, P and K uptake by the palmito plant.
- There is a positive relation between the uptake of other nutrients and N-P-K fertilization.
- There is a positive relation between N-P-K fertilization and fresh and dry matter production.
- Leaf area increase of Bactris gasipaes is source dependent.

2. MATERIAL AND METHODS

A detailed report about the first period of the N-P-K fertilizer trial is given in the report of Jongschaap (1993). The material and methods that were essential in the second period of the research are mentioned as complete as possible in this report. This chapter is split up in 3 paragraphs. The first paragraph discusses the experimental field and the chosen statistical approach. The second deals with the N-P-K fertilization and the laboratory measurements. These are the destructive measurements. The last paragraph deals with the non-destructive measurements on the leaves of the plants in the field. This paragraph contains the method to find an equation to estimate the leaf area of forked (bifid) and feathered leafs.

2.1 The experimental field

The experimental field was located on the farm of Agropalmito in Guápiles. It is a rather flat 1.15 hectare piece of land. The soil is an alluvial deposit. It is classified as an Andosol (Thaptic Haplodand) according to the FAO classification. The young palm trees were planted by Jongschaap (13-16 July 1991). Jongschaap selected plants that were more or less the same size. Plants measured about 30 cm at that time (JONGSCHAAP, 1993). The distances in the rows are 1 meter and between the rows 2.5 meter.
A fertilizer trial of N, P and K had to be constructed in a way in which the separate effects of nitrogen, phosphorus and potassium could be estimated on one hand and the interactions between these fertilizers on the other. To reduce the size of the field a choice was made for the confounded 3x3x2 factorial test as described by Cochan and Cox (1957). Four replicates were used. Using this method the separate N-P-K effects will come to full expression, while the interaction effects are less clear. NxP effect is expressed for 7/8 part and NxPxK for 5/8 part. The loss in accuracy is little while the area of the experimental field (and the work) is reduced to surveyable size.
There are four different replications possible. Every replication consists of three blocks. The experimental field was divided into 4 replications. First the type of every replication was determined by raffling. After that the blocks were assigned by lot. The result of this is shown in figure 2.1.2.
Plots consisted of 16 plants (4x4 plants). The four plants in the center were harvested (figure 2.1.1).

.	.	.	.
.	x	x	.
.	x	x	.
.	.	.	.

Figure 2.1.1: One plot
x = harvested plants
. = border rows

Plants from the border rows were only used if plants in the center were in bad condition due to other causes than the treatment (damage by plagues or diseases or flooding). Plots were marked with sticks on the corners and a picket to know the treatment code in the middle. The code is explained in figure 2.1.2.
The field was kept clean of weeds using Round-up (2-8-91 and 15-2-92). To reduce damage by the 'taltuza' rats traps were placed in the parts were they appeared. No visible damage was caused by these rats.
All plots were used for the fertilizer trial. The next paragraph explains the fertilizer trial. The treatments that were used in the leaf growth measurements are marked fat in figure 2.1.2. Paragraph 2.3 is about this part of the research.

Figure 2.1.2: The experimental field.

Block 1			Block 2			Block 3			
121 2	020 1	121 4	110 3	101 1	021 3	010 1	001 3	120 4	
011 3	100 1	**201 4**	211 3	**000 4**	220 3	200 1	221 2	120 3	
210 4	201 1	100 2	110 4	000 3	000 1	001 2	**010 4**	111 3	
201 3	201 2	020 2	101 2	000 2	101 3	**221 4**	001 1	111 1	REPLICA
100 4	100 3	011 4	110 1	220 1	**220 4**	010 3	**111 4**	200 2	1
121 3	210 1	020 3	220 2	211 4	110 2	111 2	200 3	120 1	
121 1	011 1	011 2	211 1	021 1	**021 4**	221 3	200 4	221 1	
210 3	020 4	210 2	021 2	101 4	211 2	010 2	001 4	120 2	
110 4	220 1	201 2	020 2	111 3	**111 4**	101 4	211 3	120 3	
011 2	121 4	110 3	111 2	100 3	210 4	211 1	010 3	120 1	
110 2	000 1	220 3	111 1	001 2	001 3	021 3	211 2	**021 4**	
000 4	000 2	011 1	020 1	100 2	221 2	200 3	021 2	101 3	REPLICA
201 3	**220 1**	121 1	**100 4**	221 1	221 3	101 1	120 2	211 4	2
121 2	201 1	000 3	**221 4**	210 1	210 3	200 4	101 2	021 1	
011 3	110 1	**201 4**	020 4	020 3	001 1	010 1	**010 4**	010 2	
011 4	121 3	220 2	210 2	001 4	100 1	200 1	200 2	120 4	
000 4	210 2	221 1	111 1	**010 4**	010 3	020 2	200 2	211 4	
120 3	210 3	101 3	111 3	201 1	220 4	110 2	211 1	020 4	
000 2	210 1	000 1	100 3	**021 4**	021 2	121 2	121 1	020 3	
221 3	011 3	011 2	100 2	111 2	220 3	200 3	110 4	001 2	REPLICA
101 4	120 2	011 4	100 1	220 2	021 1	001 3	001 4	020 1	3
011 1	221 2	210 4	**111 4**	201 2	010 1	121 4	001 1	110 3	
101 1	000 3	120 4	**100 4**	220 1	021 3	211 2	200 1	211 3	
221 4	101 2	120 1	**201 4**	201 3	010 2	110 1	121 3	200 4	
000 2	021 2	120 4	010 3	211 4	121 3	221 3	110 1	011 4	
111 3	210 2	111 1	001 3	211 2	220 1	020 3	200 4	020 4	
201 3	**021 4**	021 1	121 4	001 2	**010 4**	200 1	**221 4**	200 2	
210 3	120 2	**111 4**	220 3	211 1	**100 4**	101 3	110 2	011 2	REPLICA
210 1	**201 4**	000 3	**220 4**	121 1	121 2	110 4	020 2	011 3	4
111 2	120 3	000 1	001 4	100 1	220 2	101 2	011 1	221 1	
210 4	201 1	201 2	001 1	100 3	010 2	200 3	221 2	020 1	
000 4	120 1	021 3	010 1	211 3	100 2	101 4	110 3	101 1	

The experimental field consists of eighteen combinations of N-P-K fertilization in four replicates. In every block 24 combinations of 4 numbers can be seen. The first three numbers are the code of the treatment. In order they are 0, 1 or 2 doses of 336 kg nitrogen per hectare, 0, 1 or 2 doses of 408 kg P_2O_5 per ha and 0 or 1 doses of 360 kg K_2O per ha. Every treatment has four small fields in one block, which are numbered from 1 to 4 corresponding to the harvest date (four and a half, eight and a half, thirteen, and seventeen months after planting).

2.2 The N-P-K fertilization trial

Every two months the fertilizer was applied in the field. Near each plant a small amount of NUTRAN (33.5% N), TSP (46% P_2O_5) and/or KCl (60% K_2O) was applied. The workers used small cups that were made for each one of the fertilizers. The code on the picket determined the dose (0, 1 or 2 cups). The total amounts per ha per year are shown in table 2.1.

Table 2.1.1: N, P and K amounts of the fertilizer trial (kg/ha/year).

NPK doses	0	1	2
N	0	336	672
P	0	408	816
K	0	360	

For this experiment palmito plants were harvested four times. Jongschaap harvested the first time. Plants were harvested at the age of four and a half months (25-11-91 - 29-11-91). At that time it was possible to harvest one replication in a day. This report shows the results of the second harvest after eight and a half month (23-3-92 - 5-4-92). Plants were much bigger at that time. Harvesting took 12 days. Every day a block was harvested and all laboratory measurements were done the same day.
Besides the aerial part of four plants a soil sample was taken of every harvested plot. This sample was taken from the first 20 centimeters of the topsoil from the central part of the plots. A sample contained soil from near the plants, from the plant wholes and the center of the plot. Samples were air dried and send to the CORBANA laboratory in La Rita (near Gúapiles). In the laboratory the amounts of the elements Ca, Mg, K, P, Fe, Cu, Zn, and Mn and the pH , CEC, organic matter content and extractable acids were measured. Soil samples were taken to check if there were any soil differences in the experimental field.
After the harvest in the morning the plants were brought to the laboratory of the Atlantic Zone Programme. The plants were cleaned with water before the measurements started. After that the total length of the plant until the top of the longest leaf and the length of the plant until the highest leaf stalk was measured. The sprouts were removed and counted and the diameter at the pseudostem base was measured.
The plants were cut in pieces for the next measurements. Leaves were cut at the beginning of the leaf stalks and counted. The fresh weight of the leaves, the stems and the sprouts was determined using a balance. The 'palmito' (the heart of palm) was extracted from the pseudostem by cutting it out. The fresh weight was determined and samples of the 'palmito' and the pseudostem were dried in an oven at 70 °C for 24 hours. Leaves were cut into veins and leaf blades. Veins were weighed and dried in the oven. The leaf area was determined using a leaf area measurer. Leaves are put on a transparent sheet and roll in a constant speed over the machine. A photoelectric cell measures the amount of light of the built-in lamp that is left through and the machine calculates the total leaf area that is passing. Also a sample of the leaf blades was dried in the oven. The total leaf area of the sprouts was determined too. Samples of the sprouts were dried as well. Samples were cut in small pieces and put in paper bags before putting them in the oven. After 24 hours all samples were weighed and new samples were taken to send to the CORBANA laboratory. These samples were put in sealed plastic bags. A back-up of each sample was stored in the AZP laboratory.
The CORBANA laboratory determined the contents of the elements N, P, K, Ca, Mg, S, Fe, Cu, Zn, and Mn of all samples (18 treatments: leaves, veins, pseudostems, heart of palm and sprouts).
The results of all measurements and laboratory data were used in statistical analyses. Results are discussed in the next chapter.

2.3 The leaf growth and sprout development of palmito of four to seven months

The same crop was used to study of both leaf formation and leaf size. Of the plants of the fourth harvest the leaves were numbered in order of appearance and leaf 5, 10 and 15 were marked with colored tape. Leaves were measured in the field. After that the leaf area was calculated. At six intervals of 21 days measurements were done on the plants of the following N-P-K combinations: 000 (no fertilizer), 221 (maximum fertilizer), 021 (no N, P and K maximal), 201 (no P), 220 (no K), 111, 100, and 010.
Jongschaap (1993) made an equation to calculate leaf area of bifid leaves of young palmito:

$$LA = L * W * 1.25 \qquad \text{(equation 2.3.1)}$$

LA = Leaf area of one bifid leaf
L = Leaf length from affixture of leaf blade on leaf stalk to leaf top
W = Leaf width from the split point of the two leaf parts to the border perpendicular on measurement L

The equation was later corrected for the bigger leaves. Jongschaaps equation is for leaves of until 4 months of age. Jongschaap measured leaf area by hand to find the equation. The equation used in this part of the palmito research was estimated using a leaf area measuring machine. For bifid leaves the following equation was found:

$$LA = L * W * 1.17 \qquad \text{(equation 2.3.2)}$$

During leaf measurements the pinnate leaves appeared. Figure 2.3.1 and 2.3.2 show both types of leaves. For the pinnate leaves another equation was found. Clement et al (1985) made an equation, but it takes too much time to do all measurements. For this purpose 150 leaves were harvested from the plants that were used by Jongschaap for the estimation of the first growth of young palmito. The plants have the same age and are planted on the same field next to the N-P-K fertilization trial. Each leaf was measured in a number of ways. The total leaf length and width, length and width of a leaflet in the middle part of the leaf and petiole length were measured. After that the leaf area was determined using the machine. Using curve fitting functions in LOTUS a simple equation had to be found. Simple and quick measurements that can be used in the field without destroying the plants were necessary. The scientific explanation of the equation was not important.
The best equation using these measurements was determined. The same L as in equation 2.3.1 and 2.3.2 was used and the square of the width of one of the leaflets in the middle part of the leaf (M^2):

$$LA = -5922.62 * 181.1289 * M^2 + 84.36324 * L \qquad \text{(equation 2.3.3)}$$

After six measurements a curve, which describes the increase in leaf area, was composed for every treatment. The curve was considered to be a function of the second order because plants were in the accelerating growth phase. The canopy was not closed yet. Plants had enough space until the sixth measurement. Figure 2.3.3 and 2.3.4 show the measurements used in the equations 2.3.2 and 2.3.3 of this research.
The equations for the 4x8 treatments (four blocks of eight treatments) were compared and statistics (ANOVA) were used to determine if equations were different. If equations are different, leaf growth in this stage is determined by the source (fertilizer treatments). If not, leaf growth may be sink determined. Plant genetics determine the size of the next leaf.
During the measurements the numbers of leaves and sprouts were counted to find differences in leaf appearance and sprout growth in the measurement period. Also an ANOVA analysis was used to find statistically significant differences.

Figure 2.3.1: Bifid leaf type of Bactris gasipaes

Figure 2.3.2: Pinnate leaf type of Bactris gasipaes

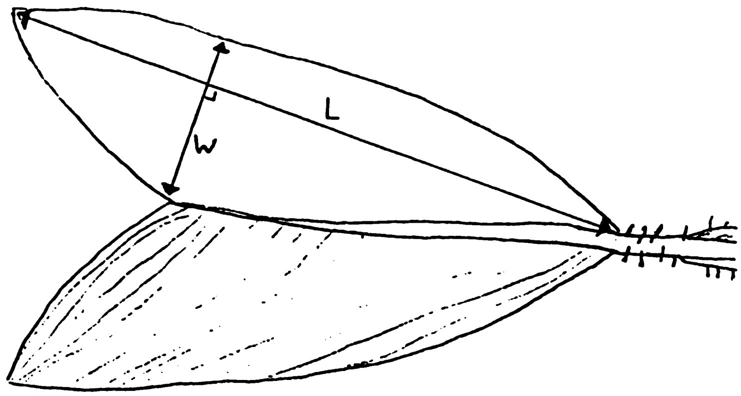


Figure 2.3.3: Measurements on the bifid leaves

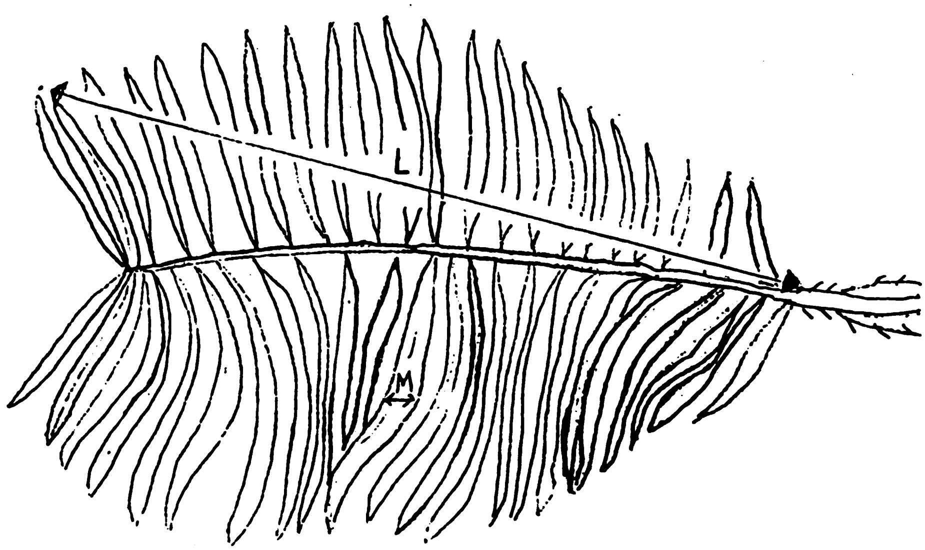


Figure 2.3.4: Measurements on pinnate leaves

3. RESULTS

The results are discussed in six paragraphs. The first paragraph discusses the results of the measurements on the entire plant and total weights and nutrient contains. The second one is about the stem, which contains the product: Palmito de pejibaye. The thirth paragraph shows the results of the leaf measurements during the second harvest of the fertilization trial. Paragraph four is about the sprout measurements of that harvest. The fifth paragraph deals with the soil samples. These samples reflect the quality of the experimental field. The last paragraph is about the time series of field measurements of leaf area and number of leaves and sprouts. Appendix 3 shows the used data and ANOVA tables of the N-P-K fertilizer trial. Appendix 4 shows the data of the time series.

3.1 Results of measurements on the entire plant

The total length until the last leaf petiole and until the top of the last leaf was measured. A significant N (1%) effect was found for both measurements (table 3.1.1).

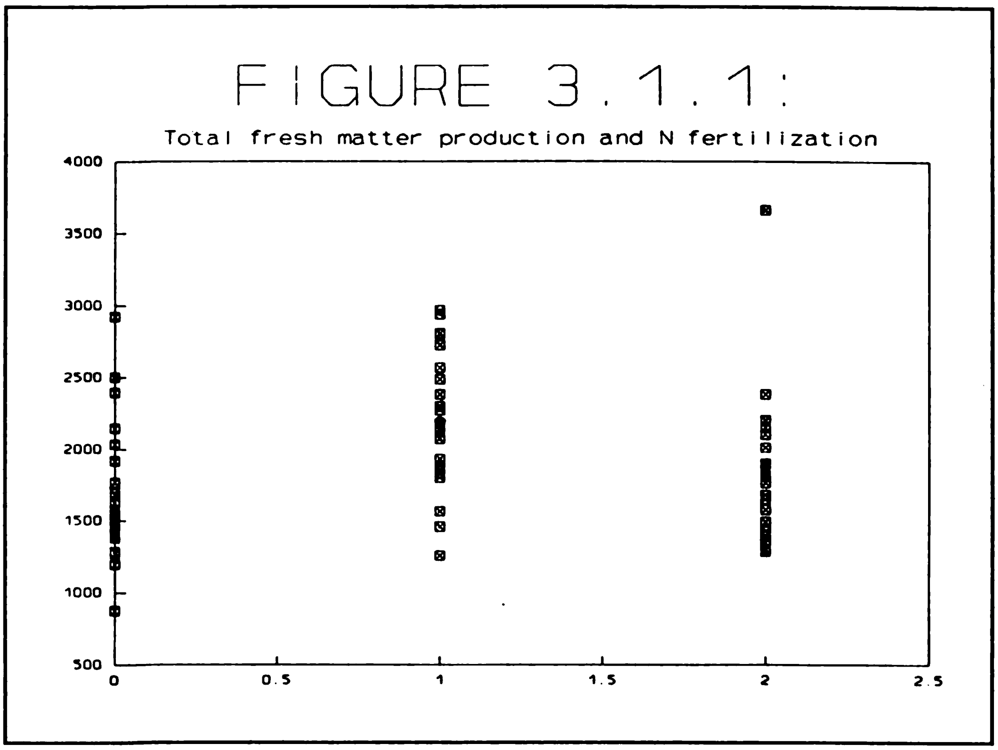
N fertilizer dose	N0	N1	N2
length until last leaf petiole	57.9	64.3	61.5
total length	168.0	183.9	175.4

Table 3.1.1: Mean values of the length until the last leaf petiole and the total length of the plants on three N fertilization levels.

For length until the last leaf petiole and total length the N treatment was split up in N0 versus N1+N2 and N1 versus N2 to find the treatment effect. Both lengths of N1 and N2 were significantly higher than measured for N0 (1%). No significant difference was found for N1 versus N2. This means that the N1 and N2 treatments show significant effects but no significant difference between the two is found.
To find out if the highest N dose causes salt damage a split analysis for N0+N2 versus N1 and N0 versus N2 was done too. In both cases a 1% significant effect was found for N0+N2 versus N1 and no significant difference between N0 and N2 was found. Salt damage is found at the highest N treatment.
A statiscally significant interaction effect (1%) of N and P was found for length until the last leaf petiole (table 3.1.2). The length until the last leaf petiole gives an indication for the length of the palmito candle. A longer candle may have a higher weight. The diameter of the stem is important for the candle weight too. This is discussed in paragraph 3.2.

Fertilization levels of N and P	N0	N1	N2
P0	55.31	66.56	58.84
P1	61.06	64.34	58.31
P2	57.34	61.97	67.31

Table 3.1.2: Mean values of the length until the last leaf petiole on three N and three P fertilization levels.



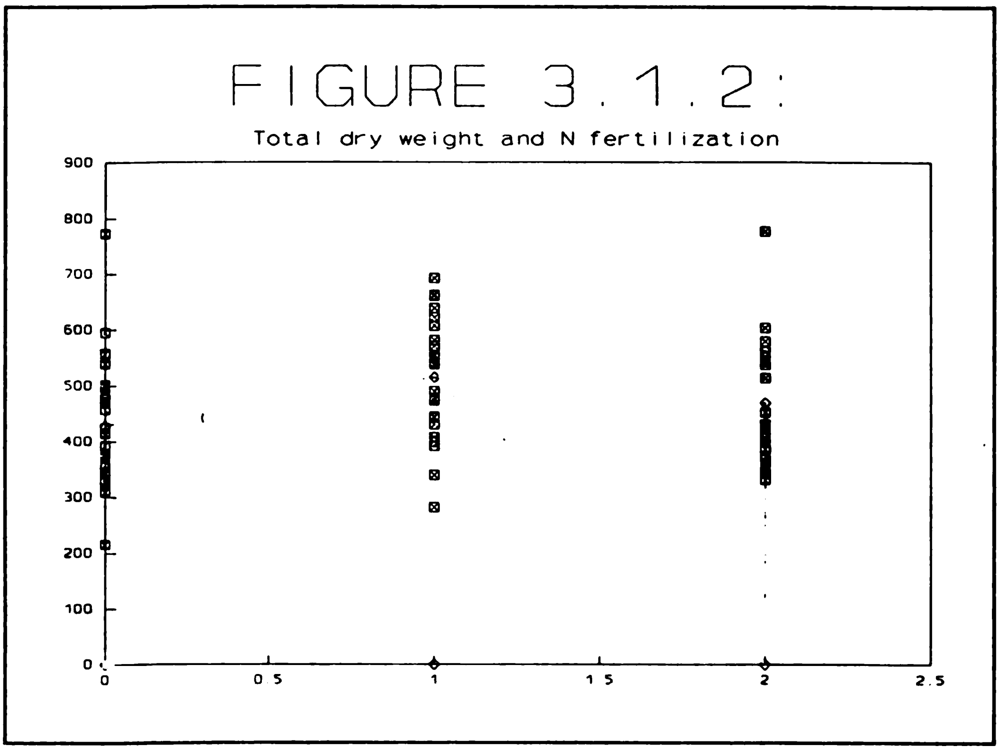
The total fresh matter weight of the plants shows the production at different fertilization levels. A 1 % significant N fertilization effect was found for the fresh matter production. The highest production was found on the N1 level. Figure 3.1.1 shows the measurements and the mean values at the three N fertilization levels. The range of the measurements is quite broad. This is found in all measurements.

The total dry matter production of the crop is even more important. Plants can take up water or lose water due to climatical circumstances. It may be that the uptake of water also depends on the fertilization level. The N fertilization shows a significant effect on the total dry matter production (figure 3.1.2). This was found for the fresh matter production too, but in dry matter production the significance was 5% instead of 1% and also a N-P interaction was found. Looking at the dry matter content of the plants a difference was found between the three N levels. The N1 level showed a higher water content than the N0 and N2 levels. This shows that the plants take up more water per amount of dry matter at this nitrogen level. The N-P interaction that was found shows that a phosphorous fertilization may be beneficial at no or a very high nitrogen gift. The highest dry matter productions are found at the levels N1P0, N2P2 and N1P1. Table 3.1.3 shows the interaction effects of N and P on total dry matter production.

N and P fertilization levels	N0	N1	N2
P0	369.8	581.4	456.8
P1	466.1	501.2	434.4
P2	450.6	460.5	514.4

Table 3.1.3: Total dry matter production per plant and N and P fertilization.

No significant higher uptake of N and P was found under higher N and P fertilization conditions. K fertilization, N fertilization and N-P fertilization show a significant effect on K uptake (1%, 5% and 5%). Plants take up more K (21%) if K fertilizer is added. The N1 level results in a higher K uptake than N0 and N2 (N0=25.43 kg/ha, N1=30.37 kg/ha, N2=26.11 kg/ha). Bigger plants have taken up more potassium. The N-P interaction shows similar effects as the N-P interaction of the length until the last leaf petiole (table 3.1.2). Table 3.1.4 shows the interaction effect. The N, P and K uptake are related to each other. When a straight line is drawn in the graphics of N and P uptake, P and K uptake and N and K uptake an R squared of 0.66, 0.63 and 0.53 respectively is found. This illustrates that plants regulate the balance between N, P and K uptake.



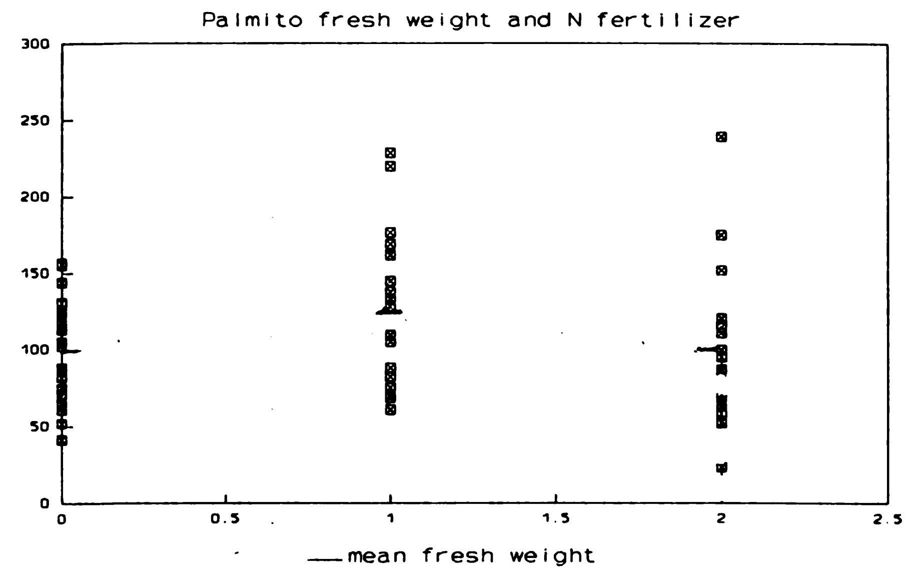
N and P fertilization levels	N0	N1	N2
P0	21.9	35.0	25.7
P1	28.1	27.2	24.0
P2	26.3	28.9	28.7

Table 3.1.4: Mean K uptake (kg/ha) of palmito plants under different N and P fertilization conditions

3.2 The pseudostem and the heart of palm

Paragraph 3.1 concluded that N fertilization had a significant effect on the length until the last leaf petiole. The size of the palmito 'candle' is also determined by its thickness. If the stem diameter is bigger, the palmito may also be bigger. The stem diameter is highest at the N1 level (1 % significant). This results in a higher palmito content also (5 % significance of N on palmito fresh weight). The palmito content of the N1 treatment is about 25% higher than the content of treatment N0 and N2. Figure 3.2.1 shows this relation and the ranges in which the measurements were found during the laboratory measurements. The diameter of the pseudostem was not determined by the potassium dose that was given, but a 1% significant effect was found for the palmito content. When potassium was added a 18.5% higher palmito content was found. Figure 3.2.2 shows the K effect on palmito content. No effects of N and K are found on palmito dry weight, but for the farmer the fresh weight is important. A less fibrous palmito candle is better for the quality. The uptake of potassium in the palmito increased (K0=2.81% and K1=3.06%). These are percentages. This means that a luxus consumption is found at the K1 level. No higher contents of N and P are found in the palmito. In the rest of the pseudostem a higher P content is found at higher P fertilization levels. The P percentage does not increase more when the fertilization level is raised from 1 to 2. The plant stops the uptake to avoid luxus consumption. The pseudostem (minus palmito) takes up more potassium at the highest K fertilization level. The weight does not increase which indicates a luxus consumption. This subject is discussed in paragraph 3.4. First the leaf measurements of the second harvest of this research is discussed.

FIGURE 3.2.1:



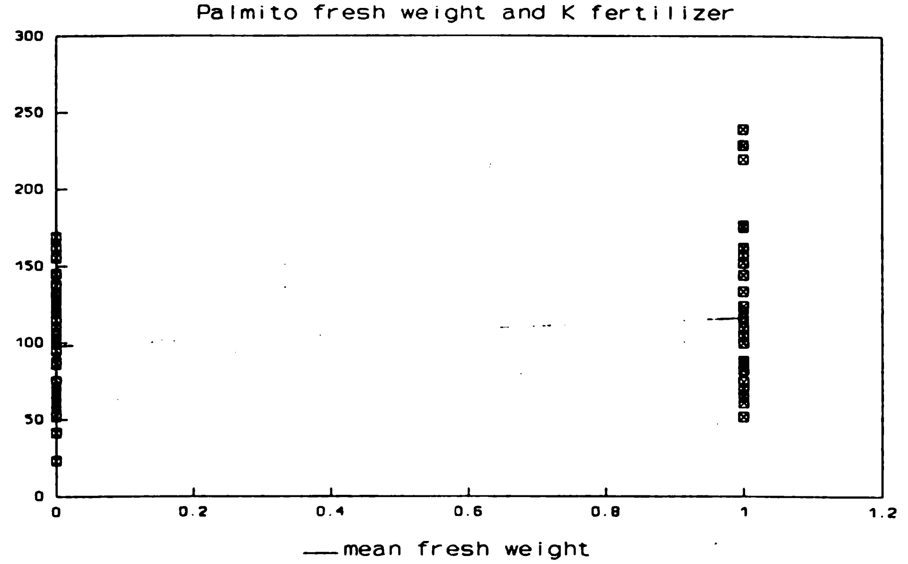
3.3 Results of the leaf measurements of the second harvest

A significant effect of N fertilization on leaf weight and leaf area could be expected. Nitrogen is important for the development of the green parts of plants. Potassium may have an effect on the leaf development too. Potassium is necessary for the construction of the plant skeleton.
No effects are found for leaf weight, specific leaf weight (gram leaf per m^2) and total leaf area without the sprouts. There are no differences in the

number of leaves between the fertilizer treatments, but a significant replication effect is found. This means that differences between the replications have an effect. It may be that the wetter replications have less leaves because of rot or illness of leaves. The leaf surfaces of the plants show no significant differences in percentages N and K. A N-K interaction is found for P percentage. A lower percentage of phosphorous is found in the leaf sheets when more N and K are added. The explanation of this may be found in the fact that the plants are bigger when more N and K are added. Phosphorous is distributed different when plants need more in the pseudostem. The pseudostem may be a stronger sink in this case. Petioles have a 1% significant higher dry weight percentage of P, when more P is added. When more N is added the percentage of P is decreasing in the petioles. Reason for this may be the increasing dry weight of the petioles due to the growth stimulating N fertilization. The dry weight K percentage of the petioles is increasing when more K is added. A higher percentage of a nutrient shows a luxus consumption. Uptake is increasing, while growth does not keep pace. Other growth factors are lacking.

FIGURE 3.2.2:

Palmito fresh weight and K fertilizer



3.4 The sprouts

The number and development of the sprouts are important for the production. Every plant has to have at least one or more sprouts for the next harvests and a well developed sprout will be harvestable after less time then a small one. Too many sprouts may result in competition between them. A well balanced sprout number is favourable.
The number of sprouts shows a 5% significant effect for N fertilization. More nitrogen results in more sprouts (N0 = 6.43 , N1 = 7.08 , N2 = 7.64 sprouts per plant, mean values). All treatments result in enough sprouts. The number of sprouts shows a significant interaction effect for N-P-K (table 3.4.1).

K0	P0	P1	P2
N0	6.63	5.25	6.56
N1	7.69	5.69	7.25
N2	8.63	8.38	6.88
K1	**P0**	**P1**	**P2**
N0	5.69	7.38	7.06
N1	8.44	6.13	7.31
N2	6.88	6.44	8.63

Table 3.4.1: Number of sprouts of Bactris gasipaes plants under different N-P-K fertilization treatments after 8.5 months (mean values per plant)

The nitrogen dose has a 5% significant effect on the leaf area of the sprouts. Sprouts have the highest total leaf area when using the N1 treatment (N0 = 674 N1 = 1384 , N2 = 1242 cm^2 per harvested plant, mean values). The sprouts with the highest leaf area are best developed and can take over growth after the harvest of the mother plant. The best treatment for more harvests per land unit is that one, which has a high leaf area per sprout. In this experiment the treatments N1P1K0 and N1P1K1 show the best results.
Sprouts take up more potassium when K is added (1% significant, K0 = 1.84% and K1 = 2.02% of the dry weight). Also an 5% significant interaction effect between N and K is found (table 3.4.2). At the N0 and N2 fertilization levels more K results in luxus consumption by the sprouts. On level N1 the percentage of K in the dry weight of the sprouts is more or less constant.

	N0	N1	N2
K0	1.85	1.93	1.74
K1	2.18	1.90	1.99

Table 3.4.2: Percentages of K in the dry sprouts of Bactris gasipaes at different N and K fertilizer treatments

	N	P	K	N*P	N*K	P*K	N*P*K
parameter:							
leaf weight	.	.	.	.	.	.	.
specific leaf weight (g*m²)	.	.	.	.	.	.	.
total leaf area (no sprouts)	.	.	.	.	.	.	.
N% dry leafs	.	.	.	.	.	.	.
P% dry leafs	.	.	.	.	5%	.	.
K% dry leafs	.	.	.	.	.	.	.
leaf number	.	.	.	.	.	.	.
N% dry pecioles	.	.	.	.	.	.	.
P% dry pecioles	1%	1%	.	.	.	.	.
K% dry pecioles	.	.	1%	.	.	.	.
pseudostem diameter	1%	.	.	.	.	.	.
N% dry pseudostem	.	.	.	.	.	.	.
P% dry pseudostem	.	5%	.	.	.	.	.
K% dry pseudostem	.	.	1%	.	.	.	.
N% dry palmito	.	.	.	.	.	.	
P% dry palmito	.	.	.	.	.	.	.
K% dry palmito	.	.	1%	.	.	.	.
Palmito fresh weight	5%	.	5%	.	.	.	.
Palmito dry weight	.	.	.	.	.	.	.
Number of sprouts	5%	.	.	.	.	.	5%
Leaf area sprouts	5%	.	.	.	.	.	.
N% in dry sprouts	.	.	.	.	.	.	.
P% in dry sprouts	.	.	.	.	.	.	.
K% in dry sprouts	.	.	1%	.	5%	.	.
Total length	1%	.	.	.	.	.	.
Length 'til last pec	1%	.	.	5%	.	.	.
Total fresh weight	1%	.	.	.	.	.	.
Total dry weight	5%	.	.	5%	.	.	.
N uptake	.	.	.	.	.	.	.
P uptake	.	.	.	.	.	.	.
K uptake	5%	.	1%	5%	.	.	.

Table 3.4.3: Summarized results of the N-P-K fertilization trial

3.5 Soil samples of the plots of the second harvest

The CORBANA laboratory made a list of the soil sample analysis data of the 72 samples that were send to them (appendix 2). The total nutrient uptake by the plants was calculated using the measurements during the harvest and the other CORBANA data about nutrient contents of the dry plant material (appendix 1). Total uptake and soil nutrient contents were compared to find a relation between soil and nutrient uptake. No linear relation between the two was found in most cases. The best positive linear relation between plant uptake and soil content was found for potassium (R squared 0.148) and manganese (R squared 0.121). No relation was found between fertilization and N, P and K contents. No relation was found between pH, CEC, organic matter content, extractable acids and nutrient uptake.

3.6 Leaf area elongation, leaf number and sprout number: A time series

The leaf measurements that were done six times in the experimental field resulted in 32*6 sprout numbers, total lengths and 32 quadratic leaf elongation equations. The number of green leaves at the last measurement was counted and the number of new formed leaves since the first measurement was calculated. Appendix 4 shows the data and ANOVA tables of the time series.
If leaf growth is sink determined, it may be found that the existing leaf area determines how much leaf area is formed in the next period. Perhaps this is a percentage of the existing leaf area. It is hard to find a significant treatment effect between two measurements, because of the flushing way of leaf appearance. Another problem is that no interaction effects can be found in an incomplete treatment set. The treatments that were selected before starting the measurements were considered to be very different, but not much was known about the reaction of the plants on these treatments.
Results were few. No treatment effect was found between the number of sprouts, the percentage of growth since the last measurement and since measurement one at measurement six, the total length of the plants, the number of green leaves at the last measurement and the number of new formed leaves at the last measurement (since the first). The significant effect for percentage growth since the first measurement at the second measurement was the result of damage of plants in the first replication of the N2P2K0 treatment.
Leaf appearance may depend on temperature. Temperature is quite constant in the experimental field. A new leaf appears about every 20 days. The first and the second harvest do not show differences in leaf number too.
During the first harvest of the N-P-K fertilization trial a significant nitrogen and N-P-K interaction effect was found for number of sprouts. This effect is not found in this part of the research. Jongschaap found a 5% significant N effect during the first harvest. The interaction effects may be the reason for no significant nitrogen effect in this small number of treatments.
The following equation describes the leaf area elongation of Bactris gasipaes in the period 4.5 until 7.5 months after planting:

$$LA(t) = LA(t_0) + t^2 * M \quad \text{(equation 3.6.1)}$$

$LA(t)$ = Leaf area in cm^2 at time t
$LA(t_0)$ = Leaf area in cm^2 at time t_0
t = time of measurement
t=(1,2,3,4,5,6)
t_0 = 21 days before the first measurement
M = Multiplication factor
(M found using curve fitting)

No significant treatment effects for $LA(t_0)$ and M were found. For these treatments equation 3.6.1 may be written in this manner:

$$LA(t) = 2437 + t^2 * 218 \ (cm^2)$$

4. DISCUSSION, CONCLUSIONS AND RECOMMENDATIONS

4.1 Discussion

The treatment effects in this experiment are considered less clear than expected. Reactions on fertilization were found in some cases, but were expected in more cases. Jongschaap, for instance, did find an effect on LAI, but the second harvest did not show the same effect. A reason may be that the bigger plants explore a larger part of the soil and thus are less depending on the fertilizer gift.
Heavy rain and phosphorous fixation causes that fertilizer is available for a very short time. Fertilizer was added every two months. Perhaps a monthly fertilization would be better. Nitrogen losses may be smaller in that case. The total uptake of nutrients may depend on fertilization. No significant higher uptake of N and P was found under higher N and P fertilization conditions. This is rather strange: An effect of N fertilization was found on total length of the plants, length until the last leaf petioles, total fresh matter production and total dry matter production, but no significant higher uptake of N was found. The P uptake may be found in the roots, but the N uptake should be in the green parts. However the losses of nitrogen are high and this may be a reason why no significance is found. Only a little amount of nitrogen may result in better growth of the crop.
Some effects may be clearer after more time. The pseudostem and the palmito weighted more for some treatments. New leaves develop from the palmito. Perhaps this will result in a higher leaf weight or area in the thirth and fourth harvest of the experiment.
Phosphorus may be beneficial for root growth. At a low N level a better root development may result in higher dry matter productions due to better availability of nutrient resources. If enough nitrogen is available a higher P dose may not be necessary for a higher dry matter production. Root development may even result in a lower aerial dry matter production. When the N dose is very high other nutrients are needed for the dry matter production and a high P dose may be beneficial (table 3.1.3).
The reason for the broad range of the measurements may be the great genetic differences between the planting material. Palmito plants show these differences because no uniform varieties have been distinguished yet. This has to be kept in mind reading the results of this experiment. There are no varieties separated for the experiment. Plant breeding with Bactris gasipaes is just starting and lots of research has to be done on this subject. Taking seedlings from the same mother plants may improve the clearness of differences between treatments.
No relation was found between pH, CEC, organic matter content, extractable acids and nutrient uptake. A reason for this result may be the small differences in the field and the many non-lineair relations and interaction effects. The differences in soil properties in this field may be small for nutrient contents, pH, CEC, organic matter and extractable acids. Significant differences between replications may be caused by differences in drainage. Jongschaap (1993) included a map in the appendices of his report that shows the places were inundation was seen after heavy rainfall.
For a better research on leaf growth of Bactris gasipaes a more complete treatment set and more and longer lasting measurements are necessary. A description of leaf growth in a sigmoid curve may be useful. Perhaps a better balanced fertilizer gift results in more leaf area on the long term. The time between leaf appearances may not be shorter, but leaves may remain longer on the plant or the area per leaf is increasing.
To find if leaf elongation is genetically determined an experiment with varieties and fertilizers may be more interesting. The great differences between the plants may be a reason for not finding results in this case too. The closing of the canopy of the crop takes a year after planting. During this time heavy rains cause losses of nutrients by leaching. This could be prevented by planting an intercrop in the first year. This can also reduce costs for the small farmer. The first year no production can be expected from a new planted field and the intercrop brings some income. The field was cleared and plowed already and this investment can be used directly.
The N-P-K fertilization experiment was carried out on extreme fertilizer

doses. It may be interesting to study the intermediate levels too. In this way the breakpoint between optimal fertilization and too much fertilization may be found. Perhaps an optimal fertilization with K is between the K0 and K1 level.

It may be concluded that the fertilizer levels N1, P0, and K1 are best for palmito production after eight and a half month. A higher P dose does not result in higher palmito production in this second harvest. At the moment of this harvest plants are not big enough to harvest for the product. Within a few months better conclusions may be drawn. The development of the sprouts is important too. If sprouts are well developed at the first harvest (during normal production), one of them can take over to be the next harvestable palmito. The best N-P-K combination for high production per ha due to high palmito content and well developed sprouts may be N1P1K1.

Despite the complications of working with this new prickly crop results that were found in the statistic analysis of this experiment are useful. A fertilization advice may be given. The production and the continuity of the production are considered to be the most important factors in choosing the best treatment for the crop.

Economics can not be left out when drawing conclusions. Production may be significant higher under higher fertilization conditions, but when this does not result in higher prices fertilization may be not advisable. Returns have to be at least as high as the inputs, otherwise fertilization is not useful on the short term.

4.2 Conclusions

All results of the N-P-K fertilizer trial were put together in table 3.4.3 on page 20. In short can be concluded that 336 kg nitrogen per ha per year gives the highest values for total length, length until the last leaf, total fresh and total dry weight, stem diameter, palmito fresh weight and leaf area of the sprouts. A dose of 672 kg nitrogen per ha per year damages the plants. A potassium dose of 360 kg per ha per year results in a significant higher palmito fresh weight.
The N1P0K1 treatment would be advised if continuity of the system was not important. Since the continuity of the system is important, the advice will be the N1P1K1 fertilization treatment. This treatment results in a sufficiently high number of well developed sprouts. Sprouts have a high leaf area and can take over after the harvest of the mother plant.
In this fertilization advice no economic factors are included. In general significant results show only little more production. From an economical point of view no fertilization during the first period may be advisable if fertilizer and work prices are higher than returns.
From the results of the time series no conclusions can be drawn. On the one hand no differences between treatments are found, which would be reason to conclude that leaf elongation is sink dependent, but on the other hand interactions and the number of measurements may be the reason for not finding any significant effects. More research has to be done on this subject to draw conclusions.

4.3 Recommendations for further research

More research on leaf elongation is not the only recommendation that may be given at the end of this report. In the discussion the need for a genetically more uniform crop was mentioned and research on intermediate fertilizer level with this crop was stressed.
Research on intercropping in the period from planting to closing of the canopy may be interesting, to prevent nutrient leaching. Economically this method may only be interesting in case of land shortness or in case later inputs in fertilizers and work are higher than without the intercrop. Another reason for the intercropping was mentioned already: The land preparation work can be used immediately by the farmer.

LITERATURE

Anonymous, 1983. Pejibaye (Bactris gasipaes H.B.K). Palmeras poco utilizadas de América Tropical. Informe de la reunión de consulta organizada por FAO y CATIE, pages 11-14. Turrialba, Costa Rica, august 8-10, 1983.

Anonymous, 1985. Perfil técnico para la producción de corazon de palmito de pejibaye. Centro de Promoción de las Exportaciones e Inversiones. Preparado por Sempre S. A. (Asesoria y Servicios Empresariales).

Anonymous, 1986. El pejibaye (Bactris gasipaes H. B. K.). Proyecto Agroforestal Anai Talamanca, Limón. Serie de boletines técnicos para el agricultor. Boletin Técnico No. 3.

Arias, A. M. and C. R. Clement, 1982. Pejibaye (Bactris gasipaes). Bibliografía parcialmente anotada. Centro Agronómico Tropical de Investigación y Enseñanza - CATIE, Unidad de Recursos Genéticos CATIE/GTZ, Turrialba, Costa Rica.

Burgos, C., 1977. Descripción de los sistemas de cultivo y algunas carecteristicas de los agricultores de Guápiles, Pococi, Costa Rica. Centro Agronomico Tropical de Investigación y Enseñanza, Departemento de Cultivos y Suelos Tropicales. Documento presentado en la reunión internacional de colaboración técnica CATIE-CIAT-CIMMYT-IICA celebrada en Turrialba, Costa Rica del 2 al 3 de junio, 1977.

Clement, C. R., J. Mora, S. de S. Costa, 1985. Estimación del área foliar de la palma de pejibaye (Bactris gasipaes H.B.K). Revista Biologica Tropical, 33 (2): 99-105, 1985.

Clement, C. R.,1988. Domestication of the Pejibaye Palm (Bactris gasipaes): Past and Present. Advances in Economic Botany 6: pag. 155-174. The New York Botanical Garden, New York.

Delgado, R., 1990-1. La taltuza (Orthogeomys cherriei) como plaga del cultivo de pejibaye. Serie Técnica Pejibaye (Guilielma). Boletín Informativo, Vol II, N° 1, 1990, pages 10-17. Universidad de Costa Rica.

Delgado, R., 1990-2. Construcción de túneles y ciclo reproductivo de la taltuza Orthogeomys cherriei (Allen) (Rodentia: Geomyidae). Estación Experimental 'Los Diamantes', Ministerio de Agricultura y Ganadería, Guápiles, Limón, Costa Rica.

Guzmán, P., 1985. Nutrición y fertilización del pejibaye. 'Repuesta del pejibaye para palmito a la aplicación de N-P-K'. Diversificación Agrícola. ASBANA (Asociación de Bananeras Nacional), 1985.

Jongschaap, R., 1993. Report of the first harvest.

León, J., 1987. Botanica de los cultivos tropicales. Instituto Interamericano de Cooperación para la Agricultura. San José, Costa Rica.

Lleras, E., 1986. Nomenclature in peach palm complex.

MAG, 1983. Pejibaye. Manual de recomendaciones. Cultivos agricolas de Costa Rica. Boletín Técnico N° 62, pages 188-189. Ministerio de Agricultura y Ganadería.

Mora, J., 1983. El pejibaye (Bactris gasipaes H.B.K): origin, biología floral y manejo agronómico. Palmeras poco utilizadas de América Tropical. Informe de la reunión de la consulta organizada por FAO y CATIE, pages 118-160. Turrialba, Costa Rica, august 8-10, 1983.

Mora, J., 1987. Pejibaye: analisis de una alternativa de desarrollo. Seminario sobre el estado de la investigación cientifica la acción social sobre la Región Atlántica, Ciudad de Limón 5, 6, 7 august, 1987. Patrocinan: Vicerrectorías y Acción Social de la Universidad de Costa Rica, RECOPE, Instituto Geográfico Nacional, JAPDEVA, CONICIT. Universidad de Costa Rica y Centro Regional Universitario de Limón.

Purseglove, J. W., 1985. Tropical crops. Monocotyledons. Fifth impression, revised and updated. Longman Inc., New York.

Sollins, P., G. Uehara and G. P. Robertson, 1986. Nutrient cycling in the humid tropics. Nutrient cycling in relation to soil type in the humid tropics. Department of Forest Science, Oregon State University, Corvallis, Oregon USA. Department of Agronomy and Soil Science, University of Hawaii at Manoa, Honolulu, Hawaii USA. W. K. Kellogg Biological Station, Michigan State University, Hickory Corners, Michigan USA.

APPENDIX 1:

Plant nutrient contents

CORBANA S.A., LA RITA
LABORATORIO QUIMICO DE SUELOS Y FOLIAR
RESULTADO DE ANALISIS FOLIARES

FOLIA

REPORTE No : 1022 F
FECHA DE RECIBO :20/04/92
FECHA DE ENTREGA :02/07/92
FECHA DEL MUESTREO:14/04/92
No DE MUESTREO :

. Convenio CATIE-U.A.W. - M.A.G.

CODIGO DE INGRESO	CODIGO DE CAMPO	% sobre base seca						ppm					OBSERVACIONES
		N	P	K	Ca	Mg	S	Fe	Cu	Zn	Mn	B	
39792	Jorg UAW Pul 1 000	4.30	0.52	2.45	0.31	0.56	0.24	215	39	644	25		/
39793	Jorg UAW Pul 1 001	3.81	0.65	2.84	0.44	0.72	0.34	149	25	177	43		Palmito
39794	Jorg UAW Pul 1 010	3.81	0.76	2.81	0.31	0.73	0.27	103	22	104	30		
39795	Jorg UAW Pul 1 011	3.64	0.68	3.07	0.45	0.58	0.32	97	23	134	44		
39796	Jorg UAW Pul 1 020	2.91	0.70	2.44	0.39	0.66	0.32	79	25	167	25		
39797	Jorg UAW Pul 1 021	4.53	0.62	3.15	0.31	0.60	0.32	80	23	122	23		hojas
39798	Jorg UAW Pul 1 100	4.53	0.65	3.29	0.41	0.66	0.24	89	20	77	47		
39799	Jorg UAW Pul 1 101	4.50	0.58	3.10	0.36	0.56	0.23	65	17	52	62		peciolos
39800	Jorg UAW Pul 1 110	3.87	0.69	2.75	0.42	0.60	0.21	132	15	75	50		
39801	Jorg UAW Pul 1 111	3.81	0.59	2.97	0.42	0.60	0.29	106	25	207	29		palmito
39802	Jorg UAW Pul 1 120	4.44	0.65	2.73	0.36	0.83	0.27	113	20	130	48		tallos
39803	Jorg UAW Pul 1 121	3.43	0.60	2.78	0.35	0.71	0.26	110	19	89	52		
39804	Jorg UAW Pul 1 200	4.62	0.57	2.14	0.35	0.61	0.22	67	22	145	35		(Raíces)
39805	Jorg UAW Pul 1 201	4.70	0.53	2.29	0.40	0.62	0.23	166	24	133	43		
39806	Jorg UAW Pul 1 210	3.26	0.59	2.66	0.30	0.63	0.24	73	17	79	51		
39807	Jorg UAW Pul 1 211	4.27	0.77	3.30	0.37	0.71	0.25	224	13	153	59		
39808	Jorg UAW Pul 1 220	4.01	0.59	2.32	0.36	0.77	0.26	84	20	168	34		
39809	Jorg UAW Tal 1 221	4.53	0.66	3.18	0.37	0.63	0.25	125	15	140	43		
39810	Jorg UAW Tal 1 000	1.27	0.20	1.58	0.35	0.31	0.22	880	14	16	44		
39811	Jorg UAW Tal 1 001	1.30	0.19	1.23	0.49	0.44	0.20	4318	21	15	151		
39812	Jorg UAW Tal 1 010	1.76	0.31	1.64	0.37	0.43	0.23	1019	11	16	48		
39813	Jorg UAW Tal 1 011	1.47	0.33	1.91	0.45	0.45	0.24	520	10	15	50		
39814	Jorg UAW Tal 1 020	0.92	0.26	1.29	0.37	0.42	0.23	745	11	9	58		
39815	Jorg UAW Tal 1 021	0.95	0.22	1.68	0.32	0.23	0.21	135	10	4	28		
39816	Jorg UAW Tal 1 100	0.98	0.20	1.86	0.33	0.26	0.11	164	9	6	37		
39817	Jorg UAW Tal 1 101	1.18	0.20	1.75	0.29	0.29	0.21	3050	15	17	96		
39818	Jorg UAW Tal 1 110	1.04	0.22	2.03	0.37	0.25	0.19	427	9	7	44		
39819	Jorg UAW Tal 1 111	1.15	0.32	1.52	0.41	0.29	0.14	452	9	11	55		
39820	Jorg UAW Tal 1 120	1.27	0.24	1.12	0.40	0.40	0.23	533	9	25	56		
39821	Jorg UAW Tal 1 121	1.50	0.20	1.57	0.31	0.31	0.12	261	8	10	70		
39822	Jorg UAW Tal 1 200	1.50	0.25	1.47	0.35	0.35	0.21	566	12	83	50		
39823	Jorg UAW Tal 1 201	1.39	0.18	1.52	0.26	0.26	0.18	3050	22	30	87		
39824	Jorg UAW Tal 1 210	2.11	0.26	1.53	0.24	0.27	0.14	374	11	14	78		
39825	Jorg UAW Tal 1 211	1.27	0.19	1.14	0.33	0.25	0.11	310	8	28	88		
39826	Jorg UAW Tal 1 220	1.07	0.24	1.29	0.38	0.29	0.11	258	7	7	64		
39827	Jorg UAW Tal 1 221	1.73	0.20	1.81	0.30	0.31	0.20	359	10	18	54		
39828	Jorg UAW hoj 1 020	3.00	0.18	0.98	0.54	0.40	0.39	354	12	18	81		
39829	Jorg UAW hoj 1 021	3.69	0.22	1.55	0.34	0.28	0.34	193	12	21	80		
39830	Jorg UAW hoj 1 100	3.12	0.19	1.53	0.29	0.26	0.21	170	12	16	68		
39831	Jorg UAW hoj 1 101	3.29	0.17	1.10	0.43	0.38	0.21	265	12	9	152		
39832	Jorg UAW hoj 1 110	3.84	0.17	1.27	0.54	0.38	0.22	254	17	16	82		
39833	Jorg UAW hoj 1 111	4.16	0.20	1.30	0.43	0.31	0.21	173	8	11	102		
39834	Jorg UAW hoj 1 120	3.49	0.24	1.43	0.25	0.27	0.19	140	12	15	72		
39835	Jorg UAW hoj 1 121	4.39	0.19	1.79	0.38	0.24	0.23	210	9	12	152		
39836	Jorg UAW hoj 1 200	4.04	0.18	1.04	0.52	0.32	0.19	216	8	12	123		

239837	Jorg	UAW	hoj	1	201	3.69	[illegible]	0.91	0.43	[illegible]	[illegible]	365	15	[illegible]	173	
239838	Jorg	UAW	hoj	1	210	4.73	0.18	1.28	0.41	[illegible]	[illegible]	329	9	10	184	
239839	Jorg	UAW	hoj	1	211	3.69	0.17	1.28	0.48	0.35	[illegible]	262	20	12	201	
239840	Jorg	UAW	hoj	1	220	4.50	0.18	1.29	0.41	0.34	0.21	247	23	11	163	
239841	Jorg	UAW	hoj	1	221	4.16	0.19	1.37	0.43	0.32	0.21	[illegible]	11	12	116	
239842	Jorg	UAW	Pec	1	000	1.82	0.21	[illegible]	[illegible]	0.16	0.14	72	7	4	21	
239843	Jorg	UAW	Pec	1	001	1.01	0.19	2.59	0.23	0.20	0.14	199	7	6	39	
239844	Jorg	UAW	Pec	1	010	0.98	0.25	[illegible]	[illegible]	0.24	0.12	191	10	6	34	
239845	Jorg	UAW	Pec	1	011	1.39	0.29	2.45	0.27	0.23	0.17	213	9	11	41	
239846	Jorg	UAW	Pec	1	020	1.24	0.23	2.20	0.28	0.19	0.15	586	9	8	43	
239847	Jorg	UAW	Pec	1	021	1.50	0.18	2.41	0.24	0.17	0.18	123	9	10	32	
239848	Jorg	UAW	Pec	1	100	0.98	0.14	2.13	0.19	0.15	0.10	75	7	3	20	
239849	Jorg	UAW	Pec	1	101	1.04	0.12	2.31	0.25	0.19	0.07	173	6	3	58	
239850	Jorg	UAW	Pec	1	110	1.10	0.21	2.91	0.23	0.18	0.10	143	8	6	37	
239851	Jorg	UAW	Pec	1	111	1.01	0.11	1.83	0.17	0.16	0.05	73	8	3	35	
239852	Jorg	UAW	Pec	1	120	1.18	0.21	2.01	0.26	0.18	0.09	74	7	4	29	
239853	Jorg	UAW	Pec	1	121	0.95	0.27	3.22	0.29	0.16	0.07	72	7	2	44	
239854	Jorg	UAW	Pec	1	200	1.04	0.13	2.00	0.34	0.20	0.05	168	7	5	63	
239855	Jorg	UAW	Pec	1	201	0.70	0.11	1.87	0.28	0.20	0.10	107	6	2	62	
239856	Jorg	UAW	Pec	1	210	0.66	0.16	1.68	0.26	0.17	0.05	85	6	3	62	
239857	Jorg	UAW	Pec	1	211	0.75	0.18	2.42	0.28	0.19	0.09	159	10	5	121	
239858	Jorg	UAW	Pec	1	220	0.72	0.17	1.79	0.31	0.18	0.06	173	5	5	89	
239859	Jorg	UAW	Pec	1	221	0.75	0.25	2.15	0.22	0.18	0.11	122	11	13	47	
239860	Jorg	UAW	hij	1	000	1.82	0.19	1.79	0.23	0.23	0.22	238	8	11	32	
239861	Jorg	UAW	hij	1	001	1.85	0.22	1.80	0.19	0.22	0.23	715	11	13	57	
239862	Jorg	UAW	hij	1	010	1.88	0.26	2.09	0.18	0.20	0.21	1323	18	17	52	
239863	Jorg	UAW	hij	1	011	1.88	0.25	2.25	0.20	0.20	0.21	3472	25	23	100	
239864	Jorg	UAW	hij	1	020	1.70	0.24	1.65	0.20	0.23	0.21	2498	16	19	66	
239865	Jorg	UAW	hij	1	021	1.65	0.30	2.29	0.25	0.26	0.24	651	13	19	56	
239866	Jorg	UAW	hij	1	100	2.19	0.21	1.93	0.22	0.24	0.11	586	12	14	53	
239867	Jorg	UAW	hij	1	101	1.53	0.22	1.88	0.21	0.23	0.17	3609	24	16	100	
239868	Jorg	UAW	hij	1	110	2.14	0.25	2.08	0.20	0.20	0.20	382	11	12	36	
239869	Jorg	UAW	hij	1	111	2.40	0.26	2.09	0.24	0.21	0.14	515	12	13	78	
239870	Jorg	UAW	hij	1	120	1.93	0.25	1.95	0.22	0.24	0.16	130	10	9	38	
239871	Jorg	UAW	hij	1	121	1.82	0.24	2.15	0.18	0.20	0.16	878	13	13	68	
239872	Jorg	UAW	hij	1	200	1.96	0.27	1.75	0.19	0.18	0.13	1462	16	18	73	
239873	Jorg	UAW	hij	1	201	2.11	0.19	1.61	0.18	0.24	0.12	487	[illegible]	10	76	
239874	Jorg	UAW	hij	1	210	1.53	0.23	1.21	0.19	0.18	0.10	275	11	7	74	
239875	Jorg	UAW	hij	1	211	1.90	0.24	2.23	0.19	0.23	0.14	588	14	12	135	
239876	Jorg	UAW	hij	1	220	1.99	0.24	1.67	0.21	0.20	0.14	1146	18	13	77	
239877	Jorg	UAW	hij	1	221	2.05	0.26	2.33	0.20	0.23	0.18	702	17	11	61	
239878	Jorg	UAW	hij	2	000	2.11	0.24	2.18	0.20	0.21	0.22	152	15	14	34	
239879	Jorg	UAW	hij	2	001	2.16	0.25	2.02	0.21	0.20	0.20	341	18	16	55	
239880	Jorg	UAW	hij	2	010	1.67	0.23	1.33	0.27	0.31	0.30	170	19	12	56	
239881	Jorg	UAW	hij	2	011	1.88	0.27	2.50	0.28	0.22	0.27	305	18	15	47	
239882	Jorg	UAW	hij	2	020	1.96	0.26	1.66	0.19	0.23	0.13	466	11	15	47	
239883	Jorg	UAW	hij	2	021	2.02	0.26	2.18	0.24	0.26	0.17	432	12	19	98	
239884	Jorg	UAW	hij	2	100	1.88	0.22	1.99	0.21	0.22	0.19	157	11	12	52	
239885	Jorg	UAW	hij	2	101	1.62	0.23	2.12	0.19	0.24	0.19	477	15	9	52	
239886	Jorg	UAW	hij	2	110	1.99	0.25	1.86	0.18	0.23	0.17	817	15	13	64	
239887	Jorg	UAW	hij	2	111	2.11	0.25	2.16	0.22	0.20	0.14	422	16	16	90	
239888	Jorg	UAW	hij	2	120	1.88	0.22	1.77	0.26	0.22	0.18	331	11	10	94	
239889	Jorg	UAW	hij	2	121	1.67	0.17	1.38	0.23	0.28	0.19	1694	10	15	91	
239890	Jorg	UAW	hij	2	200	1.67	0.24	1.80	0.19	0.25	0.15	468	18	20	60	
239891	Jorg	UAW	hij	2	201	2.11	0.22	2.00	0.19	0.17	0.18	243	15	14	63	
239892	Jorg	UAW	hij	2	210	1.85	0.26	1.84	0.21	0.21	0.13	201	12	8	39	
239893	Jorg	UAW	hij	2	211	2.19	0.16	1.32	0.30	0.24	0.18	589	17	13	81	

						N	P	K	Ca	Mg	S				
239894	Jorg	UAW	hoj	2	220	2.31	[illegible].25	2.04	0.22	[illegible]	0.10	542	13		63
239895	Jorg	UAW	Hoj	1	221	1.82	0.23	2.[illegible]	0.[illegible]	0.20	0.17	[illegible]	12		7[illegible]
239896	Jorg	UAW	Pec	2	000	0.78	0.16	2[illegible]	[illegible]9	0.13	0.05	[illegible]	13	[illegible]	24
239897	Jorg	UAW	Pec	2	001	0.75	0.16	3.[illegible]	[illegible].24	0.17	0.11		11	4	56
239898	Jorg	UAW	Pec	2	010	0.84	0.24	2.28	0.25	0.22	0.13		1[illegible]	3	34
239899	Jorg	UAW	Pec	2	011	0.66	0.29	3.21	0.32	0.20	0.16			7	59
239900	Jorg	UAW	Pec	2	020	1.10	0.26	2.07	0.21	0.19	0.14			6	38
239901	Jorg	UAW	Pec	2	021	0.69	0.21	2.84	0.20	0.19	0.13	105	12	2	35
239902	Jorg	UAW	Pec	2	100	0.72	0.16	3.09	0.23	0.16	0.06	109	11	2	36
239903	Jorg	UAW	Pec	2	101	0.81	0.11	3.35	0.29	0.20	0.11	105	8	3	49
239904	Jorg	UAW	Pec	2	110	0.87	0.20	2.43	0.25	0.21	0.09	175	11	3	48
239905	Jorg	UAW	Pec	2	111	0.81	0.22	3.25	0.33	0.16	0.10	105	9	5	45
239906	Jorg	UAW	Pec	2	120	0.66	0.19	2.56	0.22	0.15	0.10	117	8	4	46
239907	Jorg	UAW	Pec	2	121	1.53	0.24	2.12	0.28	0.21	0.11	163	11	10	68
239908	Jorg	UAW	Pec	2	200	1.21	0.15	2.51	0.30	0.19	0.09	157	11	7	68
239909	Jorg	UAW	Pec	2	201	2.40	0.27	2.05	0.20	0.20	0.13	112	14	15	74
239910	Jorg	UAW	Pec	2	210	0.78	0.17	2.03	0.25	0.16	0.05	88	8	1	37
239911	Jorg	UAW	Pec	2	211	0.84	0.13	2.42	0.35	0.21	0.06	117	8	3	75
239912	Jorg	UAW	Pec	2	220	0.66	0.20	2.41	0.28	0.23	0.07	106	11	3	48
239913	Jorg	UAW	Pec	2	221	0.69	0.16	2.57	0.25	0.17	0.06	102	8	2	64
239914	Jorg	UAW	Tal	2	000	1.21	0.28	1.42	0.38	0.41	0.21	482	17	168	38
239915	Jorg	UAW	Tal	2	001	1.07	0.21	1.98	0.28	0.27	0.18	450	23	28	48
239916	Jorg	UAW	Tal	2	010	0.98	0.24	1.30	0.29	0.28	0.17	294	14	6	29
239917	Jorg	UAW	Tal	2	011	1.04	0.28	1.78	0.35	0.31	0.18	220	23	17	89
239918	Jorg	UAW	Tal	2	020	0.89	0.21	1.46	0.26	0.24	0.11	244	12	5	24
239919	Jorg	UAW	Tal	2	021	1.01	0.26	1.24	0.30	0.40	0.20	6287	37	39	196
239920	Jorg	UAW	Tal	2	100	0.84	0.16	0.92	0.29	0.24	0.13	4791	25	20	133
239921	Jorg	UAW	Tal	2	101	0.89	0.20	1.92	0.28	0.28	0.14	1433	15	20	62
239922	Jorg	UAW	Tal	2	110	0.87	0.17	0.95	0.34	0.32	0.14	2370	14	8	77
239923	Jorg	UAW	Tal	2	111	1.04	0.20	1.42	0.33	0.26	0.16	2472	16	25	75
239924	Jorg	UAW	Tal	2	120	1.44	0.24	2.06	0.33	0.28	0.19	636	14	60	50
239925	Jorg	UAW	Tal	2	121	0.81	0.19	1.42	0.27	0.25	0.15	1721	14	12	73
239926	Jorg	UAW	Tal	2	200	1.21	0.25	1.31	0.27	0.24	0.21	857	18	22	74
239927	Jorg	UAW	Tal	2	201	0.95	0.20	1.41	0.27	0.24	0.13	3575	20	15	122
239928	Jorg	UAW	Tal	2	210	1.04	0.24	1.08	0.32	0.31	0.13	358	11	13	37
239929	Jorg	UAW	Tal	2	211	0.81	0.13	1.72	0.41	0.29	0.07	361	7	3	75
239930	Jorg	UAW	Tal	2	220	0.95	0.25	1.04	0.35	0.29	0.13	477	10	19	35
239931	Jorg	UAW	Tal	2	221	1.41	0.23	1.75	0.30	0.29	0.10	146	9	12	50
239932	Jorg	UAW	Pal	2	000	4.39	0.76	3.39	0.37	0.75	0.22	87	26	135	34
239933	Jorg	UAW	Pal	2	001	3.32	0.61	2.93	0.32	0.52	0.24	161	24	101	39
239934	Jorg	UAW	Pal	2	010	3.72	0.73	2.57	0.34	0.66	0.24	164	25	231	29
239935	Jorg	UAW	Pal	2	011	3.03	0.62	3.33	0.32	0.59	0.23	68	21	127	28
239936	Jorg	UAW	Pal	2	020	3.58	0.61	2.43	0.28	0.55	0.23	139	33	178	25
239937	Jorg	UAW	Pal	2	021	3.78	0.78	3.17	0.41	0.68	0.21	59	24	75	44
239938	Jorg	UAW	Pal	2	100	3.78	0.54	2.79	0.41	0.60	0.21	58	23	128	34
239939	Jorg	UAW	Pal	2	101	3.29	0.73	2.89	0.36	0.74	0.15	84	21	111	43
239940	Jorg	UAW	Pal	2	110	3.03	0.57	2.69	0.38	0.73	0.22	75	27	116	25
239941	Jorg	UAW	Pal	2	111	3.09	0.53	2.68	0.46	0.62	0.19	86	26	138	32
239942	Jorg	UAW	Pal	2	120	4.65	0.78	3.33	0.42	0.51	0.19	89	26	78	63
239943	Jorg	UAW	Pal	2	121	3.41	0.66	2.74	0.34	0.64	0.21	107	31	133	40
239944	Jorg	UAW	Pal	2	200	4.53	0.77	2.74	0.32	0.70	0.21	150	36	228	53
239945	Jorg	UAW	Pal	2	201	4.10	0.62	2.18	0.50	0.60	0.23	101	26	90	65
239946	Jorg	UAW	Pal	2	210	3.72	0.69	2.51	0.51	0.75	0.23	82	28	156	33
239947	Jorg	UAW	Pal	2	211	4.30	0.75	3.01	0.41	0.71	0.15	94	35	220	51
239948	Jorg	UAW	Pal	2	220	3.81	0.69	2.66	0.54	0.78	0.19	73	28	159	35
239949	Jorg	UAW	Pal	2	221	4.47	0.72	3.40	0.47	0.73	0.19	54	23	92	58
239950	Jorg	UAW	hoj	2	000	3.06	0.20	0.94	0.58	0.45	0.19	467	15	15	7[illegible]
239951	Jorg	UAW	hoj	2	001	3.58	0.18	0.93	0.61	0.36	0.21	310	15	18	13[illegible]

					11	K	X	Ca	Mn	S				
239952	Jorg	UAW	hoj	2 010	3.26	[illegible]	0.99	0.45	[illegible]	0.21	349	15	19	68
239953	Jorg	UAW	hoj	2 011	3.15	0.20	1.55	[illegible]	[illegible]	[illegible]	311	15	21	81
239954	Jorg	UAW	hoj	2 020	3.78	[illegible]	1.06	[illegible]	[illegible]	[illegible]	264	15	16	71
239955	Jorg	UAW	hoj	2 021	3.69	0.19	1.12	[illegible]	0.33	0.24	197	15	20	84
239956	Jorg	UAW	hoj	2 100	3.52	0.17	1.01	0 59	0.37	0.18	224	[illegible]	15	140
239957	Jorg	UAW	hoj	2 101	3.06	0.16	1 02	0 50	0.37	0.21	308	[illegible]	16	126
239958	Jorg	UAW	hoj	2 110	3.49	0.17	0 98	0 51	0.34	0.18	252	13	11	125
239959	Jorg	UAW	hoj	2 111	3.92	[illegible]	[illegible]	[illegible]	0.29	0.20	194	14	21	156
239960	Jorg	UAW	hoj	2 120	3.06	0.19	1.01	0.46	0.35	0.15	163	15	16	98
239961	Jorg	UAW	hoj	2 121	2.97	0.14	0.77	0.61	0.55	0.16	315	15	13	205
239962	Jorg	UAW	hoj	2 200	3.90	0.16	1.05	0.39	0.30	0.15	210	14	18	139
239963	Jorg	UAW	hoj	2 201	3.64	0.21	0.87	0.49	0.30	0.14	264	16	17	167
239964	Jorg	UAW	hoj	2 210	3.32	0.19	1.18	0.36	0.27	0.15	216	15	19	73
239965	Jorg	UAW	hoj	2 211	3.35	0.19	1.02	0.54	0.33	0.16	179	15	22	115
239966	Jorg	UAW	hoj	2 220	2.91	0.14	0.51	0.79	0.58	0.14	338	17	16	145
239967	Jorg	UAW	hoj	2 221	3.78	0.22	1.36	0.41	0.32	0.13	254	16	19	125
239968	Jorg	UAW	Tal	3 000	3.90	0.17	1.15	0.32	0.27	0.16	483	16	26	35
239969	Jorg	UAW	Tal	3 001	0.98	0.21	1.30	0.35	0.41	0.14	1625	18	42	79
239970	Jorg	UAW	Tal	3 010	1.04	0.15	1.05	0.31	0.33	0.27	325	24	65	100
239971	Jorg	UAW	Tal	3 011	1.47	0.26	1.83	0.33	0.29	0.17	3507	29	27	103
239972	Jorg	UAW	Tal	3 020	1.18	0.24	1.18	0.36	0.35	0.26	3214	20	75	89
239973	Jorg	UAW	Tal	3 021	1.01	0.28	1.79	0.43	0.50	0.17	434	18	131	48
239974	Jorg	UAW	Tal	3 100	1.04	0.17	0.93	0.29	0.33	0.09	3394	21	23	122
239975	Jorg	UAW	Tal	3 101	1.01	0.21	1.34	0.34	0.30	0.14	3982	23	33	98
239976	Jorg	UAW	Tal	3 110	0.95	0.22	1.41	0.50	0.27	0.10	306	13	64	47
239977	Jorg	UAW	Tal	3 111	1.01	0.28	1.14	0.51	0.42	0.15	4435	22	24	179
239978	Jorg	UAW	Tal	3 120	1.73	0.33	1.74	0.35	0.39	0.16	6525	41	55	[illegible]
239979	Jorg	UAW	Tal	3 121	1.18	0.31	1.96	0.51	0.48	0.15	454	12	27	82
239980	Jorg	UAW	Tal	3 200	1.10	0.22	1.54	0.30	0.26	0.14	2237	17	24	59
239981	Jorg	UAW	Tal	3 201	1.10	0.20	1.68	0.39	0.41	0.10	926	14	49	87
239982	Jorg	UAW	Tal	3 210	1.04	0.23	1.25	0.31	0.27	0.10	1670	11	29	74
239983	Jorg	UAW	Tal	3 211	1.01	0.24	1.32	0.35	0.29	0.14	5294	29	40	145
239984	Jorg	UAW	Tal	3 220	1.21	0.22	0.84	0.37	0.35	0.13	4167	38	96	150
239985	Jorg	UAW	Tal	3 221	0.98	0.21	1.63	0.40	0.36	0.07	2604	14	14	100
239986	Jorg	UAW	hij	3 000	1.96	0.25	1.86	0.21	0.24	0.14	532	13	16	50
239987	Jorg	UAW	hij	3 001	1.82	0.23	2.15	0.22	0.23	0.15	1127	16	20	69
239988	Jorg	UAW	hij	3 010	2.05	0.23	2.16	0.20	0.21	0.16	545	13	17	38
239989	Jorg	UAW	hij	3 011	2.25	0.21	2.04	0.23	0.22	0.07	484	14	18	61
239990	Jorg	UAW	hij	3 020	1.65	0.22	1.95	0.14	0.18	0.16	327	12	16	39
239991	Jorg	UAW	hij	3 021	1.93	0.27	2.13	0.21	0.23	0.16	480	14	22	47
239992	Jorg	UAW	hij	3 100	1.82	0.22	1.77	0.16	0.23	0.11	523	13	18	48
239993	Jorg	UAW	hij	3 101	1.53	0.20	1.92	0.22	0.22	0.10	180	12	14	35
239994	Jorg	UAW	hij	3 110	1.67	0.23	1.88	0.38	0.25	0.12	510	10	15	65
239995	Jorg	UAW	hij	3 111	1.96	0.15	1.62	0.24	0.23	0.12	1422	12	13	81
239996	Jorg	UAW	hij	3 120	2.37	0.23	2.07	0.24	0.21	0.09	221	11	14	55
239997	Jorg	UAW	hij	3 121	2.42	0.20	1.97	0.28	0.21	0.14	525	13	15	87
239998	Jorg	UAW	hij	3 200	2.34	0.24	1.90	0.20	0.21	0.15	1691	14	14	72
239999	Jorg	UAW	hij	3 201	2.31	0.20	2.06	0.24	0.24	0.14	1113	15	14	104
240000	Jorg	UAW	hij	3 210	2.37	0.24	1.85	0.25	0.24	0.13	984	15	15	91
240001	Jorg	UAW	hij	3 211	1.90	0.22	2.07	0.24	0.22	0.12	293	11	14	55
240002	Jorg	UAW	hij	3 220	2.05	0.20	1.54	0.24	0.22	0.11	837	14	17	[illegible]
240003	Jorg	UAW	hij	3 221	2.48	0.21	1.78	0.18	0.22	0.11	426	14	20	77
240004	Jorg	UAW	Pec	3 000	1.04	0.17	2.48	0.23	0.17	0.11	179	10	10	33
240005	Jorg	UAW	Pec	3 001	2.22	0.25	1.90	0.27	0.22	0.13	160	12	19	67
240006	Jorg	UAW	Pec	3 010	1.01	0.18	2.52	0.23	0.16	0.10	143	8	10	21
240007	Jorg	UAW	Pec	3 011	0.84	0.19	2.82	0.26	0.17	0.09	113	9	13	46
240008	Jorg	UAW	Pec	3 020	1.15	0.26	2.15	0.23	0.17	0.11	156	9	11	[illegible]
240009	Jorg	UAW	Pec	3 021	1.04	0.16	2.70	0.32	0.22	0.11	225	9	9	51
240010	Jorg	UAW	Pec	3 100	1.18	0.16	1.75	0.23	0.22	0.07	231	9	15	56

240011	Jorg	UAW	Pec	3	101	0.75	[illegible]	2.47	0.25	[illegible]	0.07	111	9	[illegible]	38
240012	Jorg	UAW	Pec	3	110	0.72	[illegible]	2.58	0.27	[illegible]	0.07	256	7	11	40
240013	Jorg	UAW	Pec	3	111	0.69	[illegible]	1.53	0.34	[illegible]	0.04	208	4	7	124
240014	Jorg	UAW	Pec	3	120	0.75	0.16	2.46	0.29	0.18	0.07	130	4	9	46
240015	Jorg	UAW	Pec	3	121	0.89	0.17	3.14	0.27	0.18	0.08	165	5	11	69
240016	Jorg	UAW	Pec	3	200	0.66	0.15	2.18	0.23	0.17	0.06	259	4	7	41
240017	Jorg	UAW	Pec	3	201	0.69	0.13	3.20	0.25	0.16	0.05	198	4	5	86
240018	Jorg	UAW	Pec	3	210	1.39	0.23	1.93	0.25	0.23	0.08	143	7	5	49
240019	Jorg	UAW	Pec	3	211	0.69	0.19	2.68	0.28	0.20	0.06	115	5	9	63
240020	Jorg	UAW	Pec	3	220	0.69	0.14	1.36	0.31	0.19	0.06	126	4	3	75
240021	Jorg	UAW	Pec	3	221	0.75	0.15	2.22	0.30	0.19	0.05	126	5	6	74
240022	Jorg	UAW	Pul	3	000	4.56	0.72	3.08	0.30	0.50	0.18	93	21	56	49
240023	Jorg	UAW	Pul	3	001	4.42	0.68	3.16	0.45	0.62	0.16	81	24	113	44
240024	Jorg	UAW	Pul	3	010	4.56	0.75	3.43	0.42	0.62	0.17	172	27	190	34
240025	Jorg	UAW	Pul	3	011	4.82	0.70	3.41	0.35	0.56	0.14	212	21	113	46
240026	Jorg	UAW	Pul	3	020	4.13	0.69	3.91	0.45	0.73	0.17	111	23	103	37
240027	Jorg	UAW	Pul	3	021	2.86	0.58	2.88	0.38	0.70	0.17	67	16	165	28
240028	Jorg	UAW	Pul	3	100	4.47	0.66	2.76	0.29	0.86	0.16	96	18	127	35
240029	Jorg	UAW	Pul	3	101	4.16	0.64	3.31	0.47	0.90	0.14	103	28	181	31
240030	Jorg	UAW	Pul	3	110	4.13	0.67	3.00	0.34	0.54	0.14	87	21	108	39
240031	Jorg	UAW	Pul	3	111	3.84	0.66	3.11	0.45	0.72	0.17	128	22	131	32
240032	Jorg	UAW	Pul	3	120	3.81	0.63	2.84	0.42	0.58	0.14	134	19	115	57
240033	Jorg	UAW	Pul	3	121	4.13	0.68	3.41	0.39	0.52	0.14	191	23	147	57
240034	Jorg	UAW	Pul	3	200	3.75	0.61	2.68	0.33	0.63	0.13	240	18	90	42
240035	Jorg	UAW	Pul	3	201	4.24	0.33	3.32	0.43	0.71	0.11	195	23	95	72
240036	Jorg	UAW	Pul	3	210	4.59	0.69	2.89	0.35	0.63	0.10	127	17	114	52
240037	Jorg	UAW	Pul	3	211	3.75	0.77	3.39	0.52	0.84	0.13	145	24	150	41
240038	Jorg	UAW	Pul	3	220	4.10	0.65	2.65	0.41	0.68	0.09	120	19	86	39
240039	Jorg	UAW	Pul	3	221	4.30	0.70	2.71	0.40	0.63	0.12	87	16	103	45
240040	Jorg	UAW	hoj	3	000	3.15	0.17	0.98	0.53	0.35	0.20	228	8	15	87
240041	Jorg	UAW	hoj	3	001	2.94	0.18	1.02	0.51	0.35	0.21	394	9	18	133
240042	Jorg	UAW	hoj	3	010	3.29	0.18	1.18	0.57	0.40	0.26	328	7	19	80
240043	Jorg	UAW	hoj	3	011	3.26	0.20	0.90	0.50	0.37	0.11	304	7	17	114
240044	Jorg	UAW	hoj	3	020	3.23	0.18	1.08	0.50	0.34	0.16	178	7	14	77
240045	Jorg	UAW	hoj	3	021	3.61	0.15	1.22	0.63	0.33	0.15	282	8	13	108
240046	Jorg	UAW	hoj	3	100	3.23	0.15	0.69	0.60	0.46	0.09	249	9	13	143
240047	Jorg	UAW	hoj	3	101	3.49	0.24	1.68	0.28	0.23	0.10	367	13	15	54
240048	Jorg	UAW	hoj	3	110	3.61	0.18	1.02	0.55	0.38	0.09	434	9	17	112
240049	Jorg	UAW	hoj	3	111	2.54	0.12	0.40	0.84	0.74	0.10	328	6	7	254
240050	Jorg	UAW	hoj	3	120	3.20	0.17	0.90	0.64	0.38	0.11	247	6	8	125
240051	Jorg	UAW	hoj	3	121	3.03	0.17	1.52	0.53	0.33	0.12	255	8	12	155
240052	Jorg	UAW	hoj	3	200	2.89	0.15	0.87	0.52	0.41	0.10	445	8	15	103
240053	Jorg	UAW	hoj	3	201	3.72	0.18	1.10	0.52	0.38	0.11	321	9	17	217
240054	Jorg	UAW	hoj	3	210	3.20	0.17	0.82	0.63	0.50	0.11	328	8	13	183
240055	Jorg	UAW	hoj	3	211	3.55	0.25	1.55	0.26	0.24	0.09	156	6	18	87
240056	Jorg	UAW	hoj	3	220	3.69	0.18	1.03	0.42	0.30	0.10	293	6	15	183
240057	Jorg	UAW	hoj	3	221	3.43	0.18	0.92	0.52	0.45	0.11	660	10	19	213
240058	Jorg	UAW	Pal	4	000	3.84	0.64	2.48	0.25	0.50	0.13	135	24	107	31
240059	Jorg	UAW	Pal	4	001	3.90	0.62	2.85	0.42	0.52	0.13	90	22	183	51
240060	Jorg	UAW	Pal	4	010	4.70	0.74	3.48	0.35	0.62	0.12	85	22	130	50
240061	Jorg	UAW	Pal	4	011	4.33	0.62	2.93	0.31	0.47	0.15	140	30	179	38
240062	Jorg	UAW	Pal	4	020	3.72	0.59	2.48	0.31	0.50	0.13	139	21	177	38
240063	Jorg	UAW	Pal	4	021	3.55	0.59	3.31	0.37	0.68	0.13	101	25	154	52
240064	Jorg	UAW	Pal	4	100	4.30	0.66	2.96	0.29	0.70	0.11	61	22	126	40
240065	Jorg	UAW	Pal	4	101	3.84	0.53	3.17	0.32	0.68	0.11	80	19	116	63
240066	Jorg	UAW	Pal	4	110	4.18	0.68	2.90	0.35	0.80	0.10	68	20	125	44
240067	Jorg	UAW	Pal	4	111	3.95	0.66	3.07	0.37	0.76	0.11	101	27	116	52
240068	Jorg	UAW	Pal	4	120	4.70	0.66	2.85	0.36	0.68	0.12	72	20	128	54
240069	Jorg	UAW	Pal	4	121	3.84	0.64	2.86	0.39	0.70	0.11	67	20	162	35
240070	Jorg	UAW	Pal	4	200	4.85	0.74	3.10	0.29	0.54	0.13	40	23	93	35

240072	Jorg	UAW	Pal	4	210	3.84	0.69	2.38	0.37	0.68	0.[illegible]	62	19	84	44
240073	Jorg	UAW	Pal	4	211	3.9[illegible]	0.67	3.14	0.[illegible]	0.72	0.[illegible]2	99	23	140	58
240074	Jorg	UAW	Pal	4	220	3.55	[illegible]58	[illegible].46	0.33	0.71	0.[illegible]3	98	28	152	41
240075	Jorg	UAW	Pal	4	221	4.1[illegible]	[illegible]	3.63	0.43	0.58	0.13	51	20	72	48
240076	Jorg	UAW	hoj	4	000	3.7[illegible]	0.25	1.16	[illegible]	0.36	0.23	192	10	17	90
240077	Jorg	UAW	hoj	4	001	3.72	0.19	1.36	0.52	0.38	0.16	183	9	21	141
240078	Jorg	UAW	hoj	4	010	3.43	0.21	1.37	0.31	0.29	0.12	150	10	24	63
240079	Jorg	UAW	hoj	4	011	3.32	0.18	1.08	0.50	0.33	0.12	223	10	19	162
240080	Jorg	UAW	hoj	4	020	3.12	0.17	0.88	0.56	0.33	0.07	296	9	23	129
240081	Jorg	UAW	hoj	4	021	3.43	0.21	1.37	0.49	0.33	0.14	236	11	19	123
240082	Jorg	UAW	hoj	4	100	3.35	0.17	1.17	0.45	0.37	0.11	170	9	19	160
240083	Jorg	UAW	hoj	4	101	3.84	0.17	1.23	0.50	0.36	0.11	222	8	14	195
240084	Jorg	UAW	hoj	4	110	3.58	0.18	0.97	0.53	0.52	0.10	328	9	18	163
240085	Jorg	UAW	hoj	4	111	3.38	0.17	0.97	0.65	0.57	0.09	400	11	16	154
240086	Jorg	UAW	hoj	4	120	3.64	0.20	0.99	0.52	0.39	0.11	493	10	21	109
240087	Jorg	UAW	hoj	4	121	3.52	0.17	1.15	0.51	0.35	0.11	183	8	10	109
240088	Jorg	UAW	hoj	4	200	3.46	0.14	0.95	0.43	0.29	0.10	223	8	15	100
240089	Jorg	UAW	hoj	4	201	3.69	0.18	1.17	0.40	0.32	0.09	170	10	11	198
240090	Jorg	UAW	hoj	4	210	3.00	0.14	0.69	0.59	0.39	0.08	212	8	10	165
240091	Jorg	UAW	hoj	4	211	3.41	0.16	0.86	0.69	0.48	0.10	268	10	13	284
240092	Jorg	UAW	hoj	4	220	3.35	0.17	0.74	0.59	0.44	0.08	623	11	14	236
240093	Jorg	UAW	hoj	4	221	4.13	0.21	1.16	0.52	0.31	0.09	385	12	20	199
240094	Jorg	UAW	Tal	4	000	1.76	0.29	1.63	0.24	0.29	0.11	3073	24	69	64
240095	Jorg	UAW	Tal	4	001	1,44	0.22	1.70	0.34	0.32	0.10	638	12	21	56
240096	Jorg	UAW	Tal	4	010	0.92	0.17	1.33	0.26	0.24	0.09	4195	21	16	138
240097	Jorg	UAW	Tal	4	011	1.01	0.25	1.42	0.35	0.29	0.14	338	14	12	62
240098	Jorg	UAW	Tal	4	020	1.36	0.25	1.65	0.32	0.25	0.15	991	11	39	54
240099	Jorg	UAW	Tal	4	021	1.04	0.26	1.83	0.30	0.30	0.11	1351	12	17	66
240100	Jorg	UAW	Tal	4	100	1.50	0.23	1.52	0.29	0.30	0.08	520	13	32	74
240101	Jorg	UAW	Tal	4	101	1.47	0.25	1.92	0.33	0.30	0.07	412	13	42	70
240102	Jorg	UAW	Tal	4	110	1.33	0.33	1.24	0.44	0.56	0.09	379	10	115	32
240103	Jorg	UAW	Tal	4	111	1.33	0.24	1.68	0.31	0.33	0.10	1359	18	28	66
240104	Jorg	UAW	Tal	4	120	1.41	0.22	1.29	0.29	0.30	0.09	3360	23	54	90
240105	Jorg	UAW	Tal	4	121	1.30	0.24	1.72	0.38	0.36	0.09	378	10	12	43
240106	Jorg	UAW	Tal	4	200	1.33	0.23	1.48	0.32	0.26	0.09	828	11	58	37
240107	Jorg	UAW	Tal	4	201	1.30	0.21	1.76	0.52	0.39	0.06	194	18	13	107
240108	Jorg	UAW	Tal	4	210	1.50	0.25	1.52	0.34	0.37	0.06	316	13	35	63
240109	Jorg	UAW	Tal	4	211	1.39	0.28	1.84	0.32	0.35	0.08	682	12	16	61
240110	Jorg	UAW	Tal	4	220	1.44	0.24	1.24	0.29	0.32	0.07	600	13	19	48
240111	Jorg	UAW	Tal	4	221	1.18	0.24	1.37	0.33	0.31	0.09	1145	31	54	207
240112	Jorg	UAW	Pec	4	000	0.84	0.24	2.08	0.30	0.21	0.10	509	10	7	43
240113	Jorg	UAW	Pec	4	001	0.81	0.19	3.04	0.32	0.21	0.06	128	9	7	73
240114	Jorg	UAW	Pec	4	010	0.75	0.24	2.02	0.27	0.18	0.07	225	11	10	37
240115	Jorg	UAW	Pec	4	011	0.75	0.25	2.36	0.28	0.16	0.07	54	7	6	41
240116	Jorg	UAW	Pec	4	020	0.81	0.19	1.20	0.15	0.08	0.07	69	7	7	34
240117	Jorg	UAW	Pec	4	021	0.78	0.23	2.50	0.29	0.18	0.13	98	7	6	54
240118	Jorg	UAW	Pec	4	100	0.75	0.10	0.41	0.29	0.17	0.06	92	5	4	83
240119	Jorg	UAW	Pec	4	101	0.87	0.16	2.75	0.35	0.19	0.06	118	5	5	95
240120	Jorg	UAW	Pec	4	110	0.72	0.17	1.95	0.27	0.18	0.05	97	7	7	50
240121	Jorg	UAW	Pec	4	111	0.87	0.17	2.76	0.28	0.17	0.05	54	6	3	49
240122	Jorg	UAW	Pec	4	120	0.92	0.20	2.05	0.35	0.24	0.05	371	7	8	64
240123	Jorg	UAW	Pec	4	121	0.81	0.21	2.65	0.27	0.17	0.06	131	6	5	41
240124	Jorg	UAW	Pec	4	200	0.75	0.15	2.42	0.26	0.14	0.06	142	7	6	30
240125	Jorg	UAW	Pec	4	201	0.95	0.09	2.33	0.32	0.24	0.05	119	6	5	107
240126	Jorg	UAW	Pec	4	210	0.75	0.12	1.39	0.30	0.19	0.03	75	5	4	47
240127	Jorg	UAW	Pec	4	211	0.92	0.20	2.81	0.37	0.21	0.04	156	6	6	142
240128	Jorg	UAW	Pec	4	220	0.81	0.19	1.66	0.27	0.18	0.04	110	6	18	63
240129	Jorg	UAW	Pec	4	221	0.72	0.21	2.69	0.28	0.14	0.05	91	5	10	55
240130	Jorg	UAW	hij	4	000	1.82	0.23	2.08	0.24	0.22	0.08	370	14	15	34
240131	Jorg	UAW	hij	4	001	2.19	0.22	2.25	0.28	0.25	0.08	397	12	18	54
240132	Jorg	UAW	hij	4	010	2.16	0.24	1.73	0.31	0.26	0.08	266	12	19	55

		N	P	K	Ca	Mg	S				
240133	Jorg UAW hij 4 011	2.[illegible]	[illegible].22	2.10	0.[illegible]	[illegible].20	[illegible]	208	10	17	60
240134	Jorg UAW hij 4 020	2.08	0.23	1.77	0.24	0.19	[illegible]	429	11	15	43
240135	Jorg UAW hij 4 021	2.[illegible]	[illegible]	2.40	0.28	0.24	0.[illegible]	539	13	19	71
~~240136~~	~~Jorg UAW hij 4 100~~	~~1.83~~	~~0.21~~	~~2.13~~	~~0.23~~	~~0.23~~	~~0.[illegible]~~	127	~~9~~	~~12~~	~~43~~
240137	Jorg UAW hij 4 101	2.16	0.22	1.57	0.28	0.21	0.[illegible]	131	12	12	97
240138	Jorg UAW hij 4 110	1.99	0.25	2.02	0.21	0.22	0.08	600	13	14	51
~~240139~~	~~Jorg UAW hij 4 111~~	~~2.05~~	~~0.28~~	~~2.04~~	~~0.24~~	~~0.27~~	~~0.05~~	~~530~~	~~12~~	~~13~~	~~82~~
240140	Jorg UAW hij 4 120	1.99	0.23	1.76	0.23	0.18	0.08	556	12	10	50
240141	Jorg UAW hij 4 121	1.73	0.25	1.94	0.23	0.20	0.07	290	11	11	48
~~240142~~	~~Jorg UAW hij 4 200~~	~~1.90~~	~~0.25~~	~~1.98~~	~~0.24~~	~~0.19~~	~~0.07~~	~~279~~	~~11~~	~~18~~	~~39~~
240143	Jorg UAW hij 4 201	2.25	0.20	1.99	0.20	0.20	0.06	160	10	12	80
240144	Jorg UAW hij 4 210	2.05	0.19	1.44	0.23	0.21	0.08	401	10	12	68
~~240145~~	~~Jorg UAW hij 4 211~~	~~1.88~~	~~0.24~~	~~2.27~~	~~0.21~~	~~0.20~~	~~0.08~~	~~444~~	~~16~~	~~15~~	~~70~~
240146	Jorg UAW hij 4 220	2.08	0.26	1.86	0.29	0.22	0.10	552	12	17	100
240147	Jorg UAW hij 4 221	1.96	0.26	2.19	0.23	0.19	0.06	425	12	19	68
~~240148~~	~~Jorg UAW hoj 3 000~~	~~3.64~~	~~0.18~~	~~1.42~~	~~0.43~~	~~0.28~~	~~0.14~~	~~199~~	~~10~~	~~17~~	~~61~~
240149	Jorg UAW hoj 4 001	3.35	0.20	0.85	0.65	0.51	0.17	1258	15	16	138
240150	Jorg UAW hoj 4 010	3.55	0.19	1.37	0.52	0.33	0.08	302	12	20	102
~~240151~~	~~Jorg UAW hoj 4 011~~	~~3.12~~	~~0.17~~	~~0.84~~	~~0.66~~	~~0.38~~	~~0.11~~	~~317~~	~~11~~	~~12~~	~~74~~

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~~JEFE DE LABORATORIO :B.Q. Javier Jaen D.~~ FIRMA : ______

SUPERVISOR :Ing. Antonio López M. FIRMA : ______

B.Q. Javier Jaen D. — Costa Rica

JJD/jmg.

APPENDIX 2:

Soil sample data

SUEL1A

CORBANA, S.A. LA RITA
LABORATORIO QUMICO - SUELOS Y FOLIARES
Suelos - Reporte de Resultados

REPORTE Nº : 682 A
FECHA DE RECIBO :20/04/92
FECHA DE ENTREGA :22/05/92
FECHA DE MUESTREO:14/04/92

Sr. Convenio Catie UAW MAG

CODIGO DE INGRESO	NUMERO DE CAMPO	pH	meq/100 g de suelo				ug/g de suelo						OBSER
			Acidez extrac	Ca	Mg	K	P	Fe	Cu	Zn	Mn	Al	
127779	Jorg UAW Tie 1000	4.84	1.26	4.49	1.71	0.52	4	339	19	2.8	24		
127780	Jorg UAW Tie 1001	4.86	1.20	4.23	1.29	0.33	1	327	30	3.2	25		
127781	Jorg UAW Tie 1002	4.82	1.96	5.00	1.80	0.47	13	382	31	3.4	22		
127782	Jorg UAW Tie 1010	4.90	0.98	6.48	1.61	1.36	66	387	34	7.2	51		
127783	Jorg UAW Tie 1020	5.06	1.28	4.81	1.33	0.35	23	302	24	0.3	19		
127784	Jorg UAW Tie 1021	4.80	1.66	4.16	1.51	0.74	29	372	25	3.9	32		
127785	Jorg UAW Tie 1100	4.84	2.28	4.34	1.60	0.55	4	391	28	5.3	26		
127786	Jorg UAW Tie 1101	4.78	2.40	3.82	1.42	0.82	2	398	32	3.3	33		palmito
127787	Jorg UAW Tie 1110	4.74	1.66	5.04	1.63	0.52	14	302	27	4.5	23		
127788	Jorg UAW Tie 1111	4.87	1.08	6.18	1.48	0.79	3	279	29	3.3	29		
127789	Jorg UAW Tie 1120	4.65	2.34	3.00	0.97	0.32	2	381	25	2.7	33		
127790	Jorg UAW Tie 1121	4.73	2.06	3.59	1.24	0.45	16	365	27	5.9	29		
127791	Jorg UAW Tie 1200	4.65	2.32	5.46	1.34	0.59	5	492	34	19.5	41		
127792	Jorg UAW Tie 1201	4.69	2.56	3.42	1.22	0.32	T	404	32	4.9	41		
127793	Jorg UAW Tie 1210	4.52	2.58	2.71	1.14	0.33	19	412	22	3.1	39		
127794	Jorg UAW Tie 1211	4.65	2.22	3.56	1.02	0.29	11	329	26	4.1	33		
127795	Jorg UAW Tie 1220	4.63	2.66	3.93	1.24	0.48	25	443	160	4.6	36		
127796	Jorg UAW Tie 1221	4.75	2.08	4.95	1.29	1.07	66	382	26	5.0	34		
127797	Jorg UAW Tie 2000	5.10	1.38	3.97	1.25	0.47	T	331	15	2.5	27		
127798	Jorg UAW Tie 2001	4.99	1.38	3.82	1.12	0.62	T	334	31	7.6	30		
127799	Jorg UAW Tie 2010	5.06	1.44	4.26	1.45	0.26	T	346	24	4.0	25		
127800	Jorg UAW Tie 2011	5.04	1.08	5.51	1.52	0.90	3	315	30	8.6	56		
127801	Jorg UAW Tie 2020	5.03	1.88	4.89	1.44	0.38	53	300	30	7.0	28		
127802	Jorg UAW Tie 2021	4.79	1.92	4.85	1.33	0.77	49	313	26	6.9	44		
127803	Jorg UAW Tie 2100	4.98	1.30	5.95	1.47	0.45	T	282	31	14.4	42		
127804	Jorg UAW Tie 2101	4.59	3.04	2.30	0.90	0.62	T	416	25	5.1	42		
127805	Jorg UAW Tie 2110	4.75	1.98	3.70	1.34	0.46	T	298	26	5.5	31		
127806	Jorg UAW Tie 2111	5.09	1.04	5.61	1.42	0.96	26	210	31	20.4	39		
127807	Jorg UAW Tie 2120	4.83	2.52	4.20	1.22	0.41	50	366	20	4.3	38		
127808	Jorg UAW Tie 2121	4.78	2.26	3.23	1.04	0.58	21	337	25	5.6	39		
127809	Jorg UAW Tie 2200	4.76	2.62	2.68	1.07	0.79	T	296	22	4.5	35		
127810	Jorg UAW Tie 2201	4.51	2.48	3.67	0.95	0.64	T	408	25	7.6	55		
127811	Jorg UAW Tie 2210	4.81	2.04	5.26	1.24	0.35	29	336	26	6.9	36		
127812	Jorg UAW Tie 2211	4.61	2.58	4.04	0.97	0.35	8	413	32	11.4	36		
127813	Jorg UAW Tie 2220	4.47	2.82	6.16	1.20	0.34	81	477	28	20.3	54		
127814	Jorg UAW Tie 2221	4.59	2.08	3.88	1.10	0.95	33	344	19	3.5	46		
127815	Jorg UAW Tie 3000	4.91	2.22	4.40	1.61	0.53	T	343	23	5.6	38		
127816	Jorg UAW Tie 3001	4.92	1.62	4.22	1.78	0.79	T	340	26	6.7	31		
127817	Jorg UAW Tie 3010	4.88	2.92	3.33	1.15	0.45	1	370	24	6.2	28		
127818	Jorg UAW Tie 3011	4.85	2.00	4.15	1.43	0.78	9	323	19	5.9	31		
127819	Jorg UAW Tie 3020	5.09	2.04	3.91	1.40	0.36	12	313	19	5.4	27		

127820	Jorg UAW Tie 3021	4.91	1.68	4.07	1.10	1.03	55	315	18	6.2	31
127821	Jorg UAW Tie 3100	4.85	2.54	3.41	1.39	0.46	13	413	24	7.4	33
127822	Jorg UAW Tie 3101	4.72	2.36	3.84	1.24	0.48	9	345	21	6.5	33
127823	Jorg UAW Tie 3110	4.75	1.72	4.48	1.43	0.52	14	301	16	5.4	24
127824	Jorg UAW Tie 3111	4.72	2.30	3.42	1.29	0.64	16	365	19	7.7	34
127825	Jorg UAW Tie 3120	4.78	1.82	4.27	1.22	0.66	21	301	19	4.6	31
127826	Jorg UAW Tie 3121	4.90	1.98	5.16	1.73	0.54	34	338	23	7.6	28
127827	Jorg UAW Tie 3200	4.79	2.82	4.01	1.35	0.43	5	370	29	7.8	36
127828	Jorg UAW Tie 3201	4.74	3.34	3.26	0.95	0.43	10	385	34	8.0	46
127829	Jorg UAW Tie 3210	4.43	2.64	3.66	0.94	0.29	21	326	31	6.6	39
127830	Jorg UAW Tie 3211	4.80	2.74	4.28	1.22	0.61	31	357	25	6.2	39
127831	Jorg UAW Tie 3220	4.49	2.84	4.07	1.03	0.33	14	367	31	7.9	52
127832	Jorg UAW Tie 3221	4.69	2.84	3.33	0.99	0.42	29	353	24	7.6	36
127833	Jorg UAW Tie 4000	4.76	1.70	4.06	1.60	0.38	10	277	216	6.7	21
127834	Jorg UAW Tie 4001	4.86	1.46	3.90	1.16	0.47	7	290	25	7.5	28
127835	Jorg UAW Tie 4010	5.10	1.96	4.42	1.36	0.26	27	310	28	6.4	21
127836	Jorg UAW Tie 4011	4.79	2.00	3.50	1.25	0.53	14	269	26	5.4	30
127837	Jorg UAW Tie 4020	4.97	2.12	4.16	1.07	0.27	48	296	27	6.3	22
127838	Jorg UAW Tie 4021	4.92	2.10	4.19	1.25	0.47	40	301	26	6.8	20
127839	Jorg UAW Tie 4100	4.80	2.72	2.58	0.81	0.24	7	304	27	6.7	29
127840	Jorg UAW Tie 4101	4.60	2.46	2.93	0.92	0.44	9	282	23	4.8	32
127841	Jorg UAW Tie 4110	4.61	3.62	3.82	1.09	0.31	56	408	30	8.9	37
127842	Jorg UAW Tie 4111	4.69	2.14	3.16	1.14	0.31	11	347	28	5.7	29
127843	Jorg UAW Tie 4120	4.64	2.12	5.11	1.45	0.39	32	317	29	8.9	30
127844	Jorg UAW Tie 4121	5.00	1.26	3.78	1.52	0.71	12	273	20	5.2	25
127845	Jorg UAW Tie 4200	5.13	0.94	7.17	1.86	0.43	10	322	32	32.5	20
127846	Jorg UAW Tie 4201	4.55	3.06	1.98	0.60	0.86	9	325	24	4.7	46
127847	Jorg UAW Tie 4210	4.63	3.18	4.33	0.92	0.19	33	329	34	7.9	26
127848	Jorg UAW Tie 4211	4.42	3.40	3.97	1.22	0.60	25	374	30	10.0	68
127849	Jorg UAW Tie 4220	4.24	3.48	3.05	0.98	0.35	32	360	27	8.0	34
127850	Jorg UAW Tie 4221	4.80	1.14	4.39	1.17	0.70	14	255	34	11.1	21

JEFE DE LABORATORIO: B.Q. Javier Jaen D. Firma :

SUPERVISOR :Ing. Antonio López Firma :

CORBANA S.A., LA RITA

LABORATORIO QUIMICO DE SUELOS Y FOLIARES

Resultado de Análisis de Cationes de Intercambio (CI), Capacidad de Intercambio Catiónico (CIC) y Materia Orgánica (MO)

Reporte No : 682 B
Fecha de recibo :20/04/92
Fecha de entrega :22/05/92
Fecha de muestreo:14/04/92

Sr. Convenio Catie UAW MAG

Código de Ingreso	Número de Campo	Meq/100 g de suelo Ca	Mg	K	Na	CIC	% M.O.	Observaciones
127779	Jorg UAW Tie 1000	3.70	1.82	0.67		39	12.64	
127780	Jorg UAW Tie 1001	3.12	1.39	0.44		40	13.10	palmito
127781	Jorg UAW Tie 1002	4.13	1.87	0.62		39	12.17	
127782	Jorg UAW Tie 1010	5.60	1.78	1.60		38	12.64	
127783	Jorg UAW Tie 1020	4.30	1.59	0.48		36	12.79	
127784	Jorg UAW Tie 1021	3.53	1.70	0.84		39	13.10	
127785	Jorg UAW Tie 1100	3.69	1.69	0.71		41	12.01	
127786	Jorg UAW Tie 1101	3.25	1.58	0.99		33	12.31	
127787	Jorg UAW Tie 1110	3.86	1.56	0.71		38	14.04	
127788	Jorg UAW Tie 1111	4.70	1.59	0.97		39	14.12	
127789	Jorg UAW Tie 1120	2.30	1.08	0.51		29	13.10	
127790	Jorg UAW Tie 1121	2.41	1.19	0.62		37	12.79	
127791	Jorg UAW Tie 1200	2.52	0.82	0.70		33	13.65	
127792	Jorg UAW Tie 1201	2.43	1.20	0.52		39	13.26	
127793	Jorg UAW Tie 1210	2.06	1.18	0.52		33	12.95	
127794	Jorg UAW Tie 1211	2.65	1.06	0.52		38	13.26	
127795	Jorg UAW Tie 1220	2.96	1.24	0.73		38	12.79	
127796	Jorg UAW Tie 1221	2.80	1.33	1.35		38	13.10	
127797	Jorg UAW Tie 2000	3.26	1.41	0.67		35	12.64	
127798	Jorg UAW Tie 2001	3.01	1.20	0.83		40	12.79	
127799	Jorg UAW Tie 2010	3.30	1.48	0.46		37	13.57	
127800	Jorg UAW Tie 2011	4.30	1.57	1.14		39	13.10	
127801	Jorg UAW Tie 2020	3.83	1.51	0.60		41	13.57	
127802	Jorg UAW Tie 2021	3.85	1.40	1.01		39	13.26	
127803	Jorg UAW Tie 2100	5.01	1.53	0.69		39	13.10	
127804	Jorg UAW Tie 2101	1.87	1.03	0.87		37	13.10	
127805	Jorg UAW Tie 2110	2.94	1.33	0.60		38	12.95	
127806	Jorg UAW Tie 2111	5.43	1.37	1.12		36	12.79	
127807	Jorg UAW Tie 2120	3.10	1.19	0.65		37	13.10	
127808	Jorg UAW Tie 2121	2.60	1.07	0.81		35	13.10	
127809	Jorg UAW Tie 2200	2.06	1.07	0.54		38	12.64	
127810	Jorg UAW Tie 2201	2.56	0.94	0.84		36	12.32	
127811	Jorg UAW Tie 2210	4.00	1.22	0.59		39	13.42	
127812	Jorg UAW Tie 2211	3.13	0.98	0.58		39	13.26	
127813	Jorg UAW Tie 2220	4.92	1.23	0.59		39	13.42	
127814	Jorg UAW Tie 2221	3.25	1.22	1.20		41	12.79	
127815	Jorg UAW Tie 3000	3.34	1.63	0.77		42	13.57	
127816	Jorg UAW Tie 3001	3.51	1.88	1.00		34	12.64	
127817	Jorg UAW Tie 3010	2.86	1.28	0.66		41	12.01	
127818	Jorg UAW Tie 3011	3.39	1.49	0.98		39	13.42	
127819	Jorg UAW Tie 3020	3.17	1.46	0.55		36	12.32	
127820	Jorg UAW Tie 3021	4.14	1.43	1.29		34	10.30	
127821	Jorg UAW Tie 3100	2.88	1.47	0.72		37	13.10	

127822	Jorg UAW Tie 3101	3.02	1.24	0.70	36	11.39
127823	Jorg UAW Tie 3110	3.53	1.45	0.71	43	12.32
127824	Jorg UAW Tie 3111	2.55	1.30	0.81	40	12.79
127825	Jorg UAW Tie 3120	3.47	1.30	0.87	39	12.48
127826	Jorg UAW Tie 3121	4.22	1.81	0.75	39	10.92
127827	Jorg UAW Tie 3200	2.97	1.45	0.64	37	12.17
127828	Jorg UAW Tie 3201	2.53	1.09	0.66	42	12.48
127829	Jorg UAW Tie 3210	2.83	1.01	0.55	37	13.32
127830	Jorg UAW Tie 3211	3.48	1.37	0.94	38	10.92
127831	Jorg UAW Tie 3220	3.21	1.22	0.57	42	12.95
127832	Jorg UAW Tie 3221	2.65	1.02	0.64	36	10.92
127833	Jorg UAW Tie 4000	3.40	1.67	0.58	39	12.48
127834	Jorg UAW Tie 4001	3.20	1.19	0.64	39	11.08
127835	Jorg UAW Tie 4010	3.64	1.42	0.45	35	9.36
127836	Jorg UAW Tie 4011	3.04	1.31	0.85	36	12.17
127837	Jorg UAW Tie 4020	3.18	1.05	0.52	39	12.01
127838	Jorg UAW Tie 4021	3.46	1.30	0.69	33	10.45
127839	Jorg UAW Tie 4100	1.80	0.78	0.46	36	12.01
127840	Jorg UAW Tie 4101	2.17	0.91	0.70	39	12.01
127841	Jorg UAW Tie 4110	2.99	1.10	0.53	38	11.08
127842	Jorg UAW Tie 4111	4.76	2.40	0.51	37	10.92
127843	Jorg UAW Tie 4120	7.72	3.04	0.62	33	10.61
127844	Jorg UAW Tie 4121	3.39	1.67	0.88	35	10.76
127845	Jorg UAW Tie 4200	5.12	1.63	0.64	37	11.70
127846	Jorg UAW Tie 4201	1.48	0.62	1.05	38	11.86
127847	Jorg UAW Tie 4210	2.64	0.94	0.35	35	9.52
127848	Jorg UAW Tie 4211	2.99	0.98	0.84	38	10.76
127849	Jorg UAW Tie 4220	2.36	0.99	0.52	34	11.39
127850	Jorg UAW Tie 4221	3.51	1.20	0.83	39	10.76

Jefe de laboratorio : I.B.Q. Javier Jaen D. Firma :

Supervisor : Ing. Antonio López Firma :

APPENDIX 3:

Data and ANOVA tables of the N-P-K trail

DATA FOR 3 x 3 x 2 FACTORIAL EXPERIMENT (CONFOUNDED)
PARAMETER: leaf weight
EXPRESSED IN: g (mean of 4 plants)

Ia		Ib		Ic		
011:	525	001:	870.25	000:	332.75	
020:	425	010:	677.75	021:	775.5	
100:	955	111:	667.75	101:	765	
121:	736	120:	647.75	110:	589.75	
201:	607.5	200:	522.75	211:	517.5	
210:	551.75	221:	575	220:	711.75	
	3800.25		3961.25		3692.25	11453.75
IIa		**IIb**		**IIc**		
010:	705.75	000:	559	001:	684	
021:	479.75	011:	742	020:	607.75	
101:	688	110:	846.25	100:	733.75	
120:	916.5	121:	921.5	111:	662	
200:	661	201:	1088.25	210:	716.25	
211:	534.5	220:	801	221:	1197.5	
	3985.5		4958		4601.25	13544.75
IIIa		**IIIb**		**IIIc**		
010:	615.5	001:	533.25	000:	623.5	
021:	902.75	020:	1414.5	011:	930.25	
100:	883.5	110:	813.5	101:	956.5	
111:	951.25	121:	451.5	120:	836.5	
201:	703.5	200:	696.25	210:	617.25	
220:	608.5	211:	837.5	221:	818	
	4665		4746.5		4782	14193.5
IVa		**IVb**		**IVc**		
011:	576.75	000:	547.25	001:	500.75	
020:	551.75	021:	585.5	010:	602.25	
101:	1015.5	111:	876.5	100:	823.25	
110:	771.5	120:	711.5	121:	590	
200:	528.75	201:	741.5	211:	680.75	
221:	634.5	210:	768.25	220:	568.5	
	4078.75		4230.5		3765.5	12074.75
						51266.75

ANALYSIS OF VARIANCE: leaf weight

SOURCE OF VARIATION	DEGREES OF FREED		SUM OF SQUARES	MEAN SQUARES	F	5%	1%
REPLICATIONS	3		268542.09	89514.03	2.76	3.21	5.12
BLOCKS IN REPLICATION	8		106727.28	13340.91	0.41	2.17	2.95
N	2		202800.95	101400.47	3.13	3.22	5.13
P	2		10237.94	5118.97	0.16	3.22	5.13
K	1		26440.42	26440.42	0.82	4.06	7.25
N x P	4	* 7/8	230862.00	57715.50	1.78	2.58	3.76
N x K	2		42694.48	21347.24	0.66	3.22	5.13
P x K	2		45472.53	22736.27	0.70	3.22	5.13
N x P x K	4	* 5/8	64461.98	16115.50	0.50	2.58	3.79
ERROR	43		1394866.66	32438.76			
TOTAL	71		2393106				

DATA FOR 3 x 3 x 2 FACTORIAL EXPERIMENT (CONFOUNDED)
PARAMETER: specific leaf weight
EXPRESSED IN: g / m2

Ia		Ib		Ic		
011:	267.4605	001:	240.6928	000:	255.2801	
020:	238.8831	010:	254.6378	021:	236.2425	
100:	228.154	111:	248.8331	101:	253.7301	
121:	272.2185	120:	232.3854	110:	293.7729	
201:	240.4701	200:	260.8948	211:	250.1157	
210:	236.8535	221:	246.1404	220:	256.6914	
	1484.039		1483.584		1545.832	4513.456
IIa		**IIb**		**IIc**		
010:	245.1874	000:	251.8716	001:	267.4525	
021:	266.3465	011:	236.8132	020:	240.0806	
101:	263.5513	110:	167.5143	100:	274.9478	
120:	177.8487	121:	257.8487	111:	279.0085	
200:	267.8732	201:	237.218	210:	220.0709	
211:	330.8031	220:	241.9222	221:	244.6903	
	1551.610		1393.188		1526.250	4471.048
IIIa		**IIIb**		**IIIc**		
010:	195.1188	001:	261.1439	000:	233.8598	
021:	248.0191	020:	256	011:	233.3727	
100:	265.065	110:	247.3332	101:	251.3915	
111:	271.5466	121:	260.8109	120:	242.9664	
201:	258.1898	200:	248.1596	210:	246.9173	
220:	257.0959	211:	238.9032	221:	262.5593	
	1495.035		1512.350		1471.067	4478.453
IVa		**IVb**		**IVc**		
011:	259.1153	000:	237.2951	001:	235.6388	
020:	290.8896	021:	213.4048	010:	227.423	
101:	227.6926	111:	226.6028	100:	250.1494	
110:	238.2054	120:	294.0437	121:	284.3625	
200:	233.1071	201:	226.6543	211:	259.347	
221:	256.4783	210:	231.9034	220:	231.2297	
	1505.488		1429.904		1488.150	4423.542
						17886.50

ANALYSIS OF VARIANCE: specific leaf weight

SOURCE OF VARIATION	DEGREES OF FREEDOM		SUM OF SQUARES	MEAN SQUARES	F	5%	1%
REPLICATIONS	3		228.26	76.09	0.11	3.21	5.12
BLOCKS IN REPLICATION	8		3506.93	438.37	0.65	2.17	2.95
N	2		319.46	159.73	0.24	3.22	5.13
P	2		222.34	111.17	0.17	3.22	5.13
K	1		1636.27	1636.27	2.43	4.06	7.25
N x P	4	* 7/8	416.73	104.18	0.15	2.58	3.76
N x K	2		445.53	222.76	0.33	3.22	5.13
P x K	2		2445.81	1222.91	1.82	3.22	5.13
N x P x K	4	* 5/8	3547.81	886.95	1.32	2.58	3.79
ERROR	43		28957.78	673.44			
TOTAL	71		41727				

DATA FOR 3 x 3 x 2 FACTORIAL EXPERIMENT (CONFOUNDED)
PARAMETER: total leaf area
EXPRESSED IN: cm2 (without sprouts)

Ia	Ib	Ic	
011: 74107	001: 110474.6	000: 41455.67	
020: 66885	010: 83504.75	021: 85250.25	
100: 126318.8	111: 83659.53	101: 94790.77	
121: 82659.86	120: 81359.18	110: 63611	
201: 80086.11	200: 63141.52	211: 64816.87	
210: 73346.24	221: 85268	220: 87120.28	
503403.0	507407.5	437044.8	1447855.

IIa	IIb	IIc	
010: 87770.9	000: 67964.46	001: 77744.82	
021: 56156.25	011: 97082.11	020: 74988.78	
101: 80115.37	110: 145623.1	100: 81584.49	
120: 156244.1	121: 92215.09	111: 74073.38	
200: 76492.38	201: 120098.1	210: 100968.5	
211: 55152.71	220: 102635.2	221: 140758.6	
511931.7	625618.0	550118.5	1687668.

IIIa	IIIb	IIIc	
010: 98162.71	001: 52175.33	000: 80996.84	
021: 110504	020: 62350.08	011: 116545.3	
100: 89051.36	110: 100219.2	101: 115061.8	
111: 104582.8	121: 55329.78	120: 105653.3	
201: 83715.16	200: 83335.76	210: 73586.48	
220: 76041.69	211: 105969.3	221: 86861.94	
562057.7	459379.4	578705.6	1600142.

IVa	IVb	IVc	
011: 66370.2	000: 71092.95	001: 66009.79	
020: 57403.32	021: 83514.93	010: 79590.25	
101: 137395.5	111: 113123.3	100: 103189.6	
110: 98509.52	120: 71850.88	121: 64815.12	
200: 70960.01	201: 102162.2	211: 84396.74	
221: 78143.2	210: 102249.4	220: 75535.41	
508781.7	543993.6	473536.9	1526312.

6261978.

IS OF VARIANCE:total leaf area

OF VARIATION	DEGREES OF FREED		SUM OF SQUARES	MEAN SQUARES	F	5%	1%
ATIONS	3		17959903776.22	5986634592.07	0.67	3.21	5.1
IN REPLICATION	8		80095781685.15	10011972710.64	1.12	2.17	2.9
	2		21099246334.74	10549623167.37	1.18	3.22	5.1
	2		17233105604.73	8616552802.37	0.96	3.22	5.1
	1		11259819641.85	11259819641.85	1.26	4.06	7.2
	4	* 7/8	33597266434.11	8399316608.53	0.94	2.58	3.7
	2		23934968567.46	11967484283.73	1.34	3.22	5.1
	2		27669584591.42	13834792295.71	1.55	3.22	5.1
x K	4	* 5/8	38804440963.89	9701110240.97	1.08	2.58	3.7
	43		384917129844.97	8951561159.19			
	71		656571247445				

DATA FOR 3 x 3 x 2 FACTORIAL EXPERIMENT (CONFOUNDED)
PARAMETER: Hoj N
EXPRESSED IN: % sobre base seca

Ia	Ib	Ic	
011: 3.12	001: 3.35	000: 3.64	
020: 3.00	010: 3.55	021: 3.69	
100: 3.12	111: 4.16	101: 3.29	
121: 4.39	120: 3.69	110: 3.84	
201: 3.69	200: 4.04	211: 3.69	
210: 4.73	221: 4.16	220: 1.50?	
0	0	3.50? 4.50? 0	0

IIa	IIb	IIc	
010: 3.26	000: 3.06	001: 3.58	
021: 3.69	011: 3.15	020: 3.78	
101: 3.08	110: 3.49	100: 3.52	
120: 3.06	121: 2.97	111: 3.92	
200: 3.90	201: 3.64	210: 3.32	
211: 3.35	220: 2.91	221: 3.78	
0	0	0	0

IIIa	IIIb	IIIc	
010: 3.29	001: 2.94	000: 3.15	
021: 3.67	020: 3.23	011: 3.26	
100: 3.23	110: 3.61	101: 3.49	
111: 2.54	121: 3.03	120: 3.20	
201: 3.72	200: 2.89	210: 3.20	
220: 3.69	211: 3.55	221: 3.43	
0	0	0	0

IVa	IVb	IVc	
011: 3.32	000: 3.75	001: 3.72	
020: 3.12	021: 3.43	010: 3.43	
101: 3.86	111: 3.38	100: 3.35	
110: 3.50	120: 3.64	121: 3.52	
200: 3.46	201: 3.69	211: 3.41	
221: 4.13	210: 3.00	220: 3.35	
0	0	0	0

0

ANALYSIS OF VARIANCE:HOJ N , % sobre base seca

SOURCE OF VARIATION	DEGREES OF FREEDOM		SUM OF SQUARES	MEAN SQUARES	F	5%	1%
REPLICATIONS	3		1.07	0.36	2.56	3.21	5.12
BLOCKS IN REPLICATION	8		1.19	0.15	1.07	2.17	2.95
N	2		0.72	0.36	2.60	3.22	5.13
P	2		0.04	0.02	0.14	3.22	5.13
K	1		0.01	0.01	0.05	4.06	7.25
N x P	4	* 7/8	0.22	0.05	0.39	2.58	3.76
N x K	2		0.01	0.01	0.05	3.22	5.13
P x K	2		0.59	0.29	2.11	3.22	5.13
N x P x K	4	* 5/8	0.49	0.12	0.89	2.58	3.79
ERROR	43		5.98	0.14			
TOTAL	71		10				

DATA FOR 3 x 3 x 2 FACTORIAL EXPERIMENT (CONFOUNDED)
PARAMETER: HOJ P
EXPRESSED IN: % sobre base seca.

Ia	Ib	Ic
011: 0.17	001: 0.20	000: 0.16
020: 0.18	010: 0.19	021: 0.22
100: 0.19	111: 0.20	101: 0.17
121: 0.19	120: 0.24	110: 0.17
201: 0.18	200: 0.18	211: 0.17
210: 0.18	221: 0.19	220: 0.18
0	0	0

IIa	IIb	IIc
010: 0.18	000: 0.20	001: 0.18
021: 0.19	011: 0.20	020: 0.20
101: 0.16	110: 0.17	100: 0.17
120: 0.14	121: 0.14	111: 0.20
200: 0.16	201: 0.21	210: 0.19
211: 0.19	220: 0.14	221: 0.22
0	0	0

IIIa	IIIb	IIIc
010: 0.18	001: 0.18	000: 0.17
021: 0.15	020: 0.18	011: 0.20
100: 0.15	110: 0.18	101: 0.24
111: 0.18	121: 0.17	120: 0.17
201: 0.18	200: 0.15	210: 0.12
220: 0.18	211: 0.25	221: 0.18
0	0	0

IVa	IVb	IVc
011: 0.18	000: 0.25	001: 0.19
020: 0.12	021: 0.21	010: 0.21
101: 0.17	111: 0.17	100: 0.17
110: 0.18	120: 0.20	121: 0.17
200: 0.14	201: 0.18	211: 0.16
221: 0.21	210: 0.14	220: 0.17
0	0	0

SIS OF VARIANCE:HOJ P , % sobre base seca

E OF VARIATION	DEGREES OF FREEDOM		SUM OF SQUARES	MEAN SQUARES	F	5%	1%
CATIONS	3		0.00	0.00	0.43	3.21	5.12
S IN REPLICATION	8		0.01	0.00	1.43	2.17	2.95
	2		0.00	0.00	1.54	3.22	5.13
	2		0.00	0.00	0.25	3.22	5.13
	1		0.00	0.00	1.66	4.06	7.25
	4	* 7/8	0.00	0.00	0.28	2.58	3.76
	2		0.00	0.00	3.67	3.22	5.13
	2		0.00	0.00	0.24	3.22	5.13
x K	4	* 5/8	0.00	0.00	1.75	2.58	3.79
	43		0.02	0.00			
	71		0				

DATA FOR 3 x 3 x 2 FACTORIAL EXPERIMENT (CONFOUNDED)
PARAMETER: HOJ K
EXPRESSED IN: % sobre base seca

Ia	Ib	Ic
011: 0.84	001: 0.85	000: 1.42
020: 0.98	010: 1.37	021: 1.55
100: 1.53	111: 1.30	101: 1.10
121: 1.79	120: 1.43	110: 1.27
201: 0.91	200: 1.04	211: 1.28
210: 1.38	221: 1.37	220: 1.29
0	0	0

IIa	IIb	IIc
010: 0.99	000: 0.97	001: 0.93
021: 1.12	011: 1.58	020: 1.06
101: 1.02	110: 0.98	100: 1.01
120: 1.01	121: 0.77	111: 1.05
200: 1.05	201: 0.87	210: 1.18
211: 1.02	220: 0.51	221: 1.36
0	0	0

IIIa	IIIb	IIIc
010: 1.18	001: 1.02	000: 0.98
021: 1.22	020: 1.08	011: 0.90
100: 0.69	110: 1.02	101: 1.60
111: 0.48	121: 1.52	120: 0.90
201: 1.10	200: 0.87	210: 0.82
220: 1.03	211: 1.55	221: 0.92
0	0	0

IVa	IVb	IVc
011: 1.08	000: 1.16	001: 1.36
020: 0.88	021: 1.37	010: 1.37
101: 1.23	111: 0.97	100: 1.17
110: 0.97	120: 0.95	121: 1.15
200: 0.95	201: 1.17	211: 0.86
221: 1.16	210: 0.69	220: 0.74
0	0	0

ANALYSIS OF VARIANCE:HOJ K , % sobre base seca

SOURCE OF VARIATION	DEGREES OF FREEDOM		SUM OF SQUARES	MEAN SQUARES	F	5%	1%
REPLICATIONS	3		0.60	0.20	3.08	3.21	5.12
BLOCKS IN REPLICATION	8		0.30	0.04	0.57	2.17	2.95
N	2		0.12	0.06	0.93	3.22	5.13
P	2		0.04	0.02	0.31	3.22	5.13
K	1		0.17	0.17	2.68	4.06	7.25
N x P	4	* 7/8	0.27	0.07	1.05	2.58	3.76
N x K	2		0.06	0.03	0.48	3.22	5.13
P x K	2		0.32	0.16	2.46	3.22	5.13
N x P x K	4	* 5/8	0.22	0.06	0.85	2.58	3.79
ERROR	43		2.79	0.06			
TOTAL	71		5				

ANALYSIS OF VARIANCE:number of leaves

SOURCE OF VARIATION	DEGREES OF FREEDOM		SUM OF SQUARES	MEAN SQUARES	F	5%	1%
REPLICATIONS	3		254.50	84.83	3.68	3.21	5.12
BLOCKS IN REPLICATION	8		72.11	9.01	0.39	2.17	2.95
N	2		62.86	31.43	1.36	3.22	5.13
P	2		78.69	39.35	1.71	3.22	5.13
K	1		9.39	9.39	0.41	4.06	7.25
N x P	4	* 7/8	19.79	4.95	0.21	2.58	3.76
N x K	2		84.36	42.18	1.83	3.22	5.13
P x K	2		16.69	8.35	0.36	3.22	5.13
N x P x K	4	* 5/8	59.69	14.92	0.65	2.58	3.79
ERROR	43		991.85	23.07			
TOTAL	71		1650				

DATA FOR 3 x 3 x 2 FACTORIAL EXPERIMENT (CONFOUNDED)
PARAMETER: # leaves
EXPRESSED IN: number (totals)

Ia		Ib		Ic		
011:	47	001:	61	000:	40	
020:	46	010:	49	021:	53	
100:	53	111:	45	101:	48	
121:	56	120:	49	110:	42	
201:	44	200:	41	211:	47	
210:	43	221:	51	220:	46	
	289		296		276	861
IIa		**IIb**		**IIc**		
010:	55	000:	46	001:	55	
021:	50	011:	46	020:	52	
101:	42	110:	56	100:	56	
120:	59	121:	49	111:	50	
200:	53	201:	60	210:	47	
211:	47	220:	52	221:	52	
	306		309		312	927
IIIa		**IIIb**		**IIIc**		
010:	47	001:	52	000:	54	
021:	56	020:	54	011:	53	
100:	59	110:	54	101:	52	
111:	54	121:	47	120:	51	
201:	53	200:	49	210:	48	
220:	53	211:	50	221:	58	
	322		306		316	944
IVa		**IVb**		**IVc**		
011:	56	000:	55	001:	52	
020:	49	021:	53	010:	58	
101:	58	111:	50	100:	47	
110:	49	120:	60	121:	56	
200:	49	201:	50	211:	51	
221:	46	210:	48	220:	55	
	307		316		319	942

DATA FOR 3 x 3 x 2 FACTORIAL EXPERIMENT (CONFOUNDED)
PARAMETER: Pec N
EXPRESSED IN: % sobre base seca

Ia		Ib		Ic	
011:	1.29	001:	1.01	000:	1.82
020:	1.24	010:	0.98	021:	1.50
100:	0.92	111:	1.01	101:	1.04
121:	0.95	120:	1.18	110:	1.10
201:	0.70	200:	1.04	211:	0.75
210:	0.66	221:	0.75	220:	0.72
	0		0		0
IIa		**IIb**		**IIc**	
010:	0.84	000:	0.78	001:	0.75
021:	0.69	011:	0.66	020:	1.10
101:	0.81	110:	0.87	100:	0.72
120:	0.66	121:	1.53	111:	0.81
200:	1.21	201:	2.40	210:	0.78
211:	0.84	220:	0.66	221:	0.69
	0		0		0
IIIa		**IIIb**		**IIIc**	
010:	1.01	001:	2.22	000:	1.04
021:	1.04	020:	1.15	011:	0.84
100:	1.18	110:	0.72	101:	0.75
111:	0.69	121:	0.89	120:	0.75
201:	0.69	200:	0.66	210:	1.39
220:	0.69	211:	0.69	221:	0.75
	0		0		0
IVa		**IVb**		**IVc**	
011:	0.75	000:	0.84	001:	0.81
020:	0.81	021:	0.78	010:	0.75
101:	0.87	111:	0.87	100:	0.75
110:	0.72	120:	0.92	121:	0.81
200:	0.75	201:	0.95	211:	0.92
221:	0.72	210:	0.75	220:	0.81
	0		0		0

ANALYSIS OF VARIANCE:PEC N , % sobre base seca

SOURCE OF VARIATION	DEGREES OF FREEDOM		SUM OF SQUARES	MEAN SQUARES	F	5%	1%
REPLICATIONS	3		0.51	0.17	1.45	3.21	5.12
BLOCKS IN REPLICATION	8		0.65	0.08	0.70	2.17	2.95
N	2		0.35	0.18	1.51	3.22	5.13
P	2		0.36	0.18	1.53	3.22	5.13
K	1		0.02	0.02	0.20	4.06	7.25
N x P	4	* 7/8	0.35	0.09	0.74	2.58	3.76
N x K	2		0.01	0.00	0.04	3.22	5.13
P x K	2		0.05	0.03	0.22	3.22	5.13
N x P x K	4	* 5/8	0.42	0.10	0.89	2.58	3.79
ERROR	43		5.02	0.12			
TOTAL	71		8				

DATA FOR 3 x 3 x 2 FACTORIAL EXPERIMENT (CONFOUNDED)
PARAMETER: PEC P
EXPRESSED IN: % sobre base seca

Ia	Ib	Ic
011: 0.29	001: 0.19	000: 0.21
020: 0.23	010: 0.23	021: 0.18
100: 0.14	111: 0.11	101: 0.12
121: 0.27	120: 0.21	110: 0.21
201: 0.11	200: 0.13	211: 0.18
210: 0.16	221: 0.25	220: 0.17
0	0	0

IIa	IIb	IIc
010: 0.24	000: 0.16	001: 0.16
021: 0.21	011: 0.29	020: 0.26
101: 0.18	110: 0.20	100: 0.16
120: 0.19	121: 0.24	111: 0.22
200: 0.15	201: 0.27	210: 0.17
211: 0.13	220: 0.20	221: 0.16
0	0	0

IIIa	IIIb	IIIc
010: 0.18	001: 0.25	000: 0.17
021: 0.16	020: 0.26	011: 0.19
100: 0.16	110: 0.11	101: 0.16
111: 0.21	121: 0.17	120: 0.16
201: 0.13	200: 0.15	210: 0.23
220: 0.14	211: 0.19	221: 0.15
0	0	0

IVa	IVb	IVc
011: 0.25	000: 0.24	001: 0.19
020: 0.19	021: 0.23	010: 0.24
101: 0.16	111: 0.17	100: 0.10
110: 0.17	120: 0.20	121: 0.21
200: 0.15	201: 0.09	211: 0.20
221: 0.21	210: 0.12	220: 0.19
0	0	0

LYSIS OF VARIANCE:PEC P , %sobre base seca

RCE OF VARIATION	DEGREES OF FREEDOM		SUM OF SQUARES	MEAN SQUARES	F	5%	1%
LICATIONS	3		0.00	0.00	0.70	3.21	5.12
CKS IN REPLICATION	8		0.01	0.00	0.96	2.17	2.95
	2		0.04	0.02	10.04	3.22	5.13
	2		0.02	0.01	6.68	3.22	5.13
	1		0.00	0.00	0.35	4.06	7.25
P	4	* 7/8	0.01	0.00	0.84	2.58	3.76
K	2		0.00	0.00	0.22	3.22	5.13
K	2		0.00	0.00	0.12	3.22	5.13
P x K	4	* 5/8	0.00	0.00	0.31	2.58	3.79
OR	43		0.08	0.00			
AL	71		0				

DATA FOR 3 x 3 x 2 FACTORIAL EXPERIMENT (CONFOUNDED)
PARAMETER: PEC K
EXPRESSED IN: % sobre base seca

Ia	Ib	Ic
011: 2.45	001: 2.59	000: 2.53
020: 2.20	010: 1.94	021: 2.41
100: 2.13	111: 1.83	101: 2.31
121: 3.22	120: 2.01	110: 2.91
201: 1.82	200: 2.00	211: 2.42
210: 1.68	221: 2.15	220: 1.79
0	0	0

IIa	IIb	IIc
010: 4.28	000: 2.38	001: 3.17
021: 2.84	011: 3.21	020: 2.07
101: 3.35	110: 2.43	100: 3.09
120: 2.56	121: 2.12	111: 3.25
200: 2.51	201: 2.05	210: 2.03
211: 2.42	220: 2.41	221: 2.57
0	0	0

IIIa	IIIb	IIIc
010: 2.72	001: 1.90	000: 2.48
021: 2.70	020: 2.15	011: 2.82
100: 1.75	110: 2.58	101: 2.47
111: 1.53	121: 3.14	120: 2.46
201: 3.20	200: 2.18	210: 1.93
220: 1.36	211: 2.68	221: 2.22
0	0	0

IVa	IVb	IVc
011: 2.36	000: 2.08	001: 3.04
020: 1.20	021: 2.50	010: 2.02
101: 2.75	111: 2.76	100: 0.41
110: 1.95	120: 2.05	121: 2.65
200: 2.42	201: 2.33	211: 2.01
221: 2.69	210: 1.39	220: 1.66
0	0	0

ANALYSIS OF VARIANCE:PEC K , % sobre base seca

SOURCE OF VARIATION	DEGREES OF FREEDOM		SUM OF SQUARES	MEAN SQUARES	F	5%	1%
REPLICATIONS	3		1.96	0.65	3.02	3.21	5.12
BLOCKS IN REPLICATION	8		0.76	0.09	0.44	2.17	2.95
N	2		0.73	0.36	1.67	3.22	5.13
P	2		0.09	0.04	0.20	3.22	5.13
K	1		4.03	4.03	18.60	4.06	7.25
N x P	4	* 7/8	1.13	0.28	1.30	2.58	3.76
N x K	2		0.03	0.01	0.06	3.22	5.13
P x K	2		0.16	0.08	0.37	3.22	5.13
N x P x K	4	* 5/8	1.84	0.46	2.12	2.58	3.79
ERROR	43		9.32	0.22			
TOTAL	71		20				

DATA FOR 3 x 3 x 2 FACTORIAL EXPERIMENT (CONFOUNDED)
PARAMETER: stem diameter at base (total of four plants)
EXPRESSED IN: cm

Ia		Ib		Ic		
011:	31.75	001:	35.25	000:	25.25	
020:	32.25	010:	32	021:	31.75	
100:	36.25	111:	30.25	101:	33.75	
121:	35.25	120:	32.75	110:	28.5	
201:	28.5	200:	31	211:	27.25	
210:	26.25	221:	34.5	220:	31	
	190.25		195.75		177.5	563.5
IIa		**IIb**		**IIc**		
010:	31	000:	27.75	001:	33.25	
021:	27.75	011:	31.75	020:	30.75	
101:	29	110:	33.5	100:	33.75	
120:	33.25	121:	34.75	111:	30	
200:	31.75	201:	33.75	210:	32.5	
211:	27	220:	33.75	221:	37.25	
	179.75		195.25		197.5	572.5
IIIa		**IIIb**		**IIIc**		
010:	30.5	001:	29.5	000:	33	
021:	34.25	020:	33	011:	34	
100:	36.25	110:	32.5	101:	37.5	
111:	36.75	121:	26.75	120:	34.75	
201:	32	200:	31.25	210:	29	
220:	29.25	211:	32.25	221:	34.25	
	199		185.25		202.5	586.75
IVa		**IVb**		**IVc**		
011:	29	000:	27.5	001:	26.5	
020:	29	021:	28.75	010:	28.5	
101:	35.75	111:	33	100:	31.25	
110:	32.25	120:	34.25	121:	27	
200:	28.5	201:	32	211:	30.75	
221:	28.25	210:	31	220:	28	
	182.75		186.5		172	541.25
						2264

ANALYSIS OF VARIANCE:Diameter at stem base

SOURCE OF VARIATION	DEGREES OF FREEDOM		SUM OF SQUARES	MEAN SQUARES	F	5%	1%
REPLICATIONS	3		60.65	20.22	3.37	3.21	5.12
BLOCKS IN REPLICATION	8		106.94	13.37	2.23	2.17	2.95
N	2		74.69	37.35	6.22	3.22	5.13
P	2		11.36	5.68	0.95	3.22	5.13
K	1		4.50	4.50	0.75	4.06	7.25
N x P	4	* 7/8	45.97	11.49	1.91	2.58	3.76
N x K	2		15.06	7.53	1.25	3.22	5.13
P x K	2		4.54	2.27	0.38	3.22	5.13
N x P x K	4	* 5/8	32.71	8.18	1.36	2.58	3.79
ERROR	43		258.10	6.00			
TOTAL	71		615				

DATA FOR 3 x 3 x 2 FACTORIAL EXPERIMENT (CONFOUNDED)
PARAMETER: TAL N
EXPRESSED IN: % sobre base seca

Ia		Ib		Ic		
011:	1.47	001:	1.30	000:	1.27	
020:	0.92	010:	1.76	021:	0.95	
100:	0.98	111:	1.15	101:	1.18	
121:	1.50	120:	1.27	110:	1.04	
201:	1.39	200:	1.50	211:	1.27	
210:	2.11	221:	1.73	220:	1.07	
	0		0		0	
IIa		**IIb**		**IIc**		
010:	0.98	000:	1.21	001:	1.07	
021:	1.81	011:	1.04	020:	0.89	
101:	0.84	110:	0.87	100:	0.81	
120:	1.44	121:	0.81	111:	1.04	
200:	1.21	201:	0.95	210:	1.04	
211:	0.81	220:	0.95	221:	1.41	
	0		0		0	
IIIa		**IIIb**		**IIIc**		
010:	1.04	001:	0.98	000:	1.90	
021:	1.01	020:	1.18	011:	1.47	
100:	1.04	110:	0.95	101:	1.01	
111:	1.01	121:	1.18	120:	1.73	
201:	1.10	200:	1.10	210:	1.04	
220:	1.21	211:	1.01	221:	0.98	
	0		0		0	
IVa		**IVb**		**IVc**		
011:	1.01	000:	1.76	001:	1.44	
020:	1.36	021:	1.04	010:	0.92	
101:	1.47	111:	1.33	100:	1.50	
110:	1.33	120:	1.41	121:	1.30	
200:	1.33	201:	1.30	211:	1.39	
221:	1.18	210:	1.50	220:	1.44	
	0		0		0	

ANALYSIS OF VARIANCE:TAL N , % sobre base seca

SOURCE OF VARIATION	DEGREES OF FREEDOM		SUM OF SQUARES	MEAN SQUARES	F	5%	1%
REPLICATIONS	3		7.19	2.40	1.49	3.21	5.12
BLOCKS IN REPLICATION	8		14.19	1.77	1.10	2.17	2.95
N	2		3.15	1.58	0.98	3.22	5.13
P	2		2.04	1.02	0.64	3.22	5.13
K	1		3.09	3.09	1.92	4.06	7.25
N x P	4	* 7/8	6.99	1.75	1.09	2.58	3.76
N x K	2		2.43	1.21	0.76	3.22	5.13
P x K	2		2.13	1.06	0.66	3.22	5.13
N x P x K	4	* 5/8	5.61	1.40	0.87	2.58	3.79
ERROR	43		69.03	1.61			
TOTAL	71		116				

DATA FOR 3 x 3 x 2 FACTORIAL EXPERIMENT (CONFOUNDED)
PARAMETER: TAL P
EXPRESSED IN: % sobre base seca

Ia	Ib	Ic
011: 0.33	001: 0.19	000: 0.20
020: 0.26	010: 0.31	021: 0.22
100: 0.20	111: 0.32	101: 0.20
121: 0.28	120: 0.24	110: 0.22
201: 0.18	200: 0.25	211: 0.19
210: 0.26	221: 0.20	220: 0.24
0	0	0

IIa	IIb	IIc
010: 0.24	000: 0.28	001: 0.21
021: 0.26	011: 0.28	020: 0.21
101: 0.20	110: 0.17	100: 0.16
120: 0.26	121: 0.19	111: 0.20
200: 0.25	201: 0.20	210: 0.24
211: 0.13	220: 0.25	221: 0.23
0	0	0

IIIa	IIIb	IIIc
010: 0.15	001: 0.21	000: 0.19
021: 0.28	020: 0.24	011: 0.26
100: 0.17	110: 0.22	101: 0.21
111: 0.28	121: 0.31	120: 0.33
201: 0.20	200: 0.22	210: 0.23
220: 0.22	211: 0.24	221: 0.21
0	0	0

IVa	IVb	IVc
011: 0.25	000: 0.29	001: 0.22
020: 0.25	021: 0.26	010: 0.17
101: 0.25	111: 0.24	100: 0.23
110: 0.33	120: 0.22	121: 0.24
200: 0.23	201: 0.21	211: 0.28
221: 0.24	210: 0.25	220: 0.24
0	0	0

LYSIS OF VARIANCE:TAL P , % sobre base seca

RCE OF VARIATION	DEGREES OF FREEDOM		SUM OF SQUARES	MEAN SQUARES	F	5%	1%
LICATIONS	3		0.01	0.00	1.03	3.21	5.12
CKS IN REPLICATION	8		0.01	0.00	0.74	2.17	2.95
	2		0.00	0.00	0.73	3.22	5.13
	2		0.01	0.01	3.48	3.22	5.13
	1		0.00	0.00	0.05	4.06	7.25
P	4	* 7/8	0.00	0.00	0.19	2.58	3.76
K	2		0.01	0.00	2.16	3.22	5.13
K	2		0.00	0.00	1.01	3.22	5.13
P x K	4	* 5/8	0.01	0.00	1.50	2.58	3.79
OR	43		0.08	0.00			
AL	71		0				

DATA FOR 3 x 3 x 2 FACTORIAL EXPERIMENT (CONFOUNDED)
PARAMETER: TAL K
EXPRESSED IN: % sobre base seca

Ia	Ib	Ic
011: 1.91	001: 1.23	000: 1.58
020: 1.29	010: 1.64	021: 1.68
100: 1.86	111: 1.52	101: 1.75
121: 1.57	120: 1.12	110: 2.03
201: 1.52	200: 1.47	211: 1.14
210: 1.53	221: 1.81	220: 1.29
0	0	0

IIa	IIb	IIc
010: 1.30	000: 1.42	001: 1.98
021: 1.24	011: 1.78	020: 1.46
101: 1.92	110: 0.45	100: 0.92
120: 2.06	121: 1.42	111: 1.42
200: 1.31	201: 1.41	210: 1.08
211: 1.72	220: 1.04	221: 1.75
0	0	0

IIIa	IIIb	IIIc
010: 1.05	001: 1.30	000: 1.15
021: 1.79	020: 1.[illegible]8	011: 1.53
100: 0.93	110: 1.41	101: 1.34
111: 1.14	121: 1.96	120: 1.74
201: 1.68	200: 1.54	210: 1.25
220: 0.84	211: 1.32	221: 1.63
0	0	0

IVa	IVb	IVc
011: 1.42	000: 1.63	001: 1.70
020: 1.65	021: 1.23	010: 1.33
101: 1.92	111: 1.68	100: 1.52
110: 1.24	120: 1.29	121: 1.72
200: 1.48	201: 1.76	211: 1.84
221: 1.37	210: 1.52	220: 1.24
0	0	0

ANALYSIS OF VARIANCE:TAL K , % sobre base seca

SOURCE OF VARIATION	DEGREES OF FREEDOM		SUM OF SQUARES	MEAN SQUARES	F	5%	1%
REPLICATIONS	3		0.28	0.09	1.04	3.21	5.12
BLOCKS IN REPLICATION	8		0.81	0.10	1.14	2.17	2.95
N	2		0.23	0.11	1.28	3.22	5.13
P	2		0.05	0.02	0.27	3.22	5.13
K	1		0.81	0.81	9.16	4.06	7.25
N x P	4	* 7/8	0.35	0.09	0.98	2.58	3.76
N x K	2		0.01	0.01	0.07	3.22	5.13
P x K	2		0.00	0.00	0.01	3.22	5.13
N x P x K	4	* 5/8	0.19	0.05	0.52	2.58	3.79
ERROR	43		3.82	0.09			
TOTAL	71		7				

DATA FOR 3 x 3 x 2 FACTORIAL EXPERIMENT (CONFOUNDED)
PARAMETER: PAL N
EXPRESSED IN: % base seco

Ia	Ib	Ic
011: 3.64	001: 3.81	000: 4.30
020: 2.91	010: 3.81	021: 4.53
100: 4.53	111: 3.01	101: 4.50
121: 3.43	120: 4.44	110: 3.87
201: 4.70	200: 4.62	211: 4.27
210: 3.26	221: 4.53	220: 4.01
0	0	0

IIa	IIb	IIc
010: 3.72	000: 4.39	001: 3.52
021: 3.78	011: 3.03	020: 3.58
101: 3.29	110: 3.03	100: 3.78
120: 4.65	121: 3.41	111: 3.09
200: 4.53	201: 4.10	210: 3.72
211: 4.30	220: 3.21	221: 4.47
0	0	0

IIIa	IIIb	IIIc
010: 4.56	001: 4.42	000: 4.56
021: 2.86	020: 4.03	011: 4.32
100: 4.47	110: 4.03	101: 4.16
111: 3.84	121: 4.3	120: 3.81
201: 4.24	200: 3.75	210: 4.59
220: 4.10	211: 3.75	221: 4.30
0	0	0

IVa	IVb	IVc
011: 4.53	000: 3.84	001: 3.90
020: 3.72	021: 3.55	010: 4.70
101: 3.84	111: 3.95	100: 4.30
110: 4.18	120: 4.70	121: 3.84
200: 4.85	201: 4.27	211: 3.98
221: 4.16	210: 3.84	220: 3.55

NALYSIS OF VARIANCE:PAL N , % sobre base seca

OURCE OF VARIATION	DEGREES OF FREEDOM		SUM OF SQUARES	MEAN SQUARES	F	5%	1%
EPLICATIONS	3		1.43	0.48	2.59	3.21	5.12
LOCKS IN REPLICATION	8		2.08	0.26	1.41	2.17	2.95
	2		0.72	0.36	1.94	3.22	5.13
	2		1.05	0.53	2.87	3.22	5.13
	1		0.27	0.27	1.45	4.06	7.25
x P	4	* 7/8	1.45	0.36	1.97	2.58	3.76
x K	2		1.07	0.53	2.91	3.22	5.13
x K	2		0.23	0.11	0.62	3.22	5.13
x P x K	4	* 5/8	0.48	0.12	0.65	2.58	3.79
RROR	43		7.91	0.18			
OTAL	71		17				

DATA FOR 3 x 3 x 2 FACTORIAL EXPERIMENT (CONFOUNDED)
PARAMETER: PAL P
EXPRESSED IN: % sobre base seca

Ia	Ib	Ic
011: 0.68	001: 0.65	000: 0.52
020: 0.70	010: 0.76	021: 0.62
100: 0.65	111: 0.59	101: 0.50
121: 0.60	120: 0.65	110: 0.69
201: 0.53	200: 0.57	211: 0.77
210: 0.59	221: 0.66	220: 0.59
0	0	0

IIa	IIb	IIc
010: 0.72	000: 0.76	001: 0.61
021: 0.78	011: 0.62	020: 0.61
101: 0.73	110: 0.57	100: 0.54
120: 0.78	121: 0.66	111: 0.53
200: 0.77	201: 0.62	210: 0.69
211: 0.75	220: 0.69	221: 0.72
0	0	0

IVa	IVb	IVc
010: 0.74	001: 0.62	000: 0.64
021: 0.59	020: 0.59	011: 0.62
100: 0.66	110: 0.68	101: 0.53
111: 0.66	121: 0.64	120: 0.66
201: 0.71	200: 0.74	210: 0.69
220: 0.58	211: 0.67	221: 0.58
0	0	0

IIIa	IIIb	IIIc
011: 0.70	000: 0.72	001: 0.68
020: 0.69	021: 0.58	010: 0.75
101: 0.64	111: 0.66	100: 0.66
110: 0.67	120: 0.63	121: 0.68
200: 0.61	201: 0.33	211: 0.77
221: 0.70	210: 0.69	220: 0.65
0	0	0

ANALYSIS OF VARIANCE:PAL P , % sobre base seca

SOURCE OF VARIATION	DEGREES OF FREEDOM		SUM OF SQUARES	MEAN SQUARES	F	5%	1%
REPLICATIONS	3		0.02	0.01	1.14	3.21	5.12
BLOCKS IN REPLICATION	8		0.10	0.01	2.42	2.17	2.95
N	2		0.01	0.00	0.78	3.22	5.13
P	2		0.03	0.02	2.92	3.22	5.13
K	1		0.00	0.00	0.76	4.06	7.25
N x P	4	* 7/8	0.03	0.01	1.31	2.58	3.76
N x K	2		0.00	0.00	0.32	3.22	5.13
P x K	2		0.00	0.00	0.39	3.22	5.13
N x P x K	4	* 5/8	0.01	0.00	0.40	2.58	3.79
ERROR	43		0.22	0.01			
TOTAL	71		0				

DATA FOR 3 x 3 x 2 FACTORIAL EXPERIMENT (CONFOUNDED)
PARAMETER: PAL K
EXPRESSED IN: % sobre base seca

Ia		Ib		Ic	
011:	3.07	001:	2.84	000:	2.45
020:	2.44	010:	2.81	021:	3.15
100:	3.29	111:	2.97	101:	3.10
121:	2.70	120:	2.73	110:	2.75
201:	2.24	200:	2.14	211:	3.30
210:	2.66	221:	3.18	220:	2.32
	0		0		0

IIa		IIb		IIc	
010:	2.57	000:	3.39	001:	2.93
021:	3.17	011:	3.33	020:	2.43
101:	2.89	110:	2.69	100:	2.79
120:	3.35	121:	2.74	111:	2.88
200:	2.74	201:	2.18	210:	2.51
211:	3.01	220:	2.66	221:	3.40
	0		0		0

IIIa		IIIb		IIIc	
010:	3.43	001:	3.16	000:	3.08
021:	2.88	020:	3.91	011:	3.41
100:	2.76	110:	3.00	101:	3.31
111:	3.11	121:	3.41	120:	2.84
201:	3.32	200:	2.60	210:	2.89
220:	2.65	211:	3.39	221:	2.71
	0		0		0

IVa		IVb		IVc	
011:	2.93	000:	2.68	001:	2.85
020:	2.40	021:	3.31	010:	3.48
101:	3.17	111:	3.07	100:	2.96
110:	2.90	120:	2.85	121:	2.86
200:	3.10	201:	2.90	211:	3.14
221:	3.68	210:	2.58	220:	2.46
	0		0		0

ANALYSIS OF VARIANCE:PAL K , % sobre base seca

SOURCE OF VARIATION	DEGREES OF FREEDOM		SUM OF SQUARES	MEAN SQUARES	F	5%	1%
REPLICATIONS	3		1.20	0.40	3.81	3.21	5.12
BLOCKS IN REPLICATION	8		0.57	0.07	0.68	2.17	2.95
N	2		0.54	0.27	2.57	3.22	5.13
P	2		0.08	0.04	0.39	3.22	5.13
K	1		1.10	1.10	10.48	4.06	7.25
N x P	4	* 7/8	0.56	0.14	1.34	2.58	3.76
N x K	2		0.39	0.19	1.85	3.22	5.13
P x K	2		0.18	0.09	0.86	3.22	5.13
N x P x K	4	* 5/8	0.52	0.13	1.24	2.58	3.79
ERROR	43		4.51	0.10			
TOTAL	71		10				

DATA FOR 3 x 3 x 2 FACTORIAL EXPERIMENT (CONFOUNDED)
PARAMETER: palmito fresh
EXPRESSED IN: g

Ia		Ib		Ic		
011:	494.4	001:	576.2969	000:	165.4686	
020:	492.02	010:	523.2972	021:	474.8463	
100:	675.6075	111:	437.641	101:	419.664	
121:	705.2592	120:	243.8962	110:	300.6386	
201:	341.024	200:	252.9676	211:	265.1442	
210:	480.0094	221:	700	220:	214.5393	
	3188.320		2734.098		1840.301	7762.72

IIa		IIb		IIc		
010:	503.749	000:	244.0922	001:	627.0983	
021:	328.7926	011:	453.0821	020:	344.3742	
101:	328.7926	110:	647.6902	100:	579.4894	
120:	274.1404	121:	878.3051	111:	436.306	
200:	398.3747	201:	398.6899	210:	482.7231	
211:	348.4313	220:	457.9861	221:	956.9355	
	2182.280		3079.845		3426.926	8689.052

IIIa		IIIb		IIIc		
010:	420.3286	001:	298.5737	000:	255.3165	
021:	465.9761	020:	620.7218	011:	352.8819	
100:	512.4764	110:	530.2689	101:	644.9846	
111:	914.3129	121:	243.7355	120:	550.4502	
201:	257.4607	200:	443.0423	210:	281.9142	
220:	232.3188	211:	480.2295	221:	607.8384	
	2802.873		2616.571		2693.385	8112.831

IVa		IVb		IVc		
011:	260.0357	000:	208.0039	001:	260.8188	
020:	409.0201	021:	417.0951	010:	285.287	
101:	533.3374	111:	647.2196	100:	530.2906	
110:	351.0741	120:	242.0506	121:	280.8909	
200:	93.92808	201:	340.6247	211:	346.374	
221:	207.6234	210:	458.2057	220:	379.868	
	1855.018		2313.199		2083.529	6251.747

ANALYSIS OF VARIANCE:palmito fresh total

SOURCE OF VARIATION	DEGREES OF FREEDOM		SUM OF SQUARES	MEAN SQUARES	F	5%	1%
REPLICATIONS	3		177633.47	59211.16	2.86	3.21	5.12
BLOCKS IN REPLICATION	8		321222.69	40152.84	1.94	2.17	2.95
N	2		169223.47	84611.73	4.08	3.22	5.13
P	2		48038.66	24019.33	1.16	3.22	5.13
K	1		95203.40	95203.40	4.59	4.06	7.25
N x P	4	* 7/8	213142.30	53285.58	2.57	2.58	3.76
N x K	2		8202.30	4101.15	0.20	3.22	5.13
P x K	2		56485.06	28242.53	1.36	3.22	5.13
N x P x K	4	* 5/8	207821.93	51955.48	2.51	2.58	3.79
ERROR	43		891045.76	20721.99			
TOTAL	71		2188019				

ANALYSIS OF VARIANCE: palmito dry weight

SOURCE OF VARIATION	DEGREES OF FREEDOM		SUM OF SQUARES	MEAN SQUARES	F	5%	1%
REPLICATIONS	3		2484.10	828.03	2.05	3.21	5.12
BLOCKS IN REPLICATION	8		5732.73	716.59	1.77	2.17	2.95
N	2		1833.83	916.92	2.27	3.22	5.13
P	2		156.12	78.06	0.19	3.22	5.13
K	1		311.98	311.98	0.77	4.06	7.25
N x P	4	* 7/8	2701.21	675.30	1.67	2.58	3.76
N x K	2		274.88	137.44	0.34	3.22	5.13
P x K	2		1168.78	584.39	1.44	3.22	5.13
N x P x K	4	* 5/8	3761.57	940.39	2.32	2.58	3.79
ERROR	43		17404.68	404.76			
TOTAL	71		35830				

DATA FOR 3 x 3 x 2 FACTORIAL EXPERIMENT (CONFOUNDED)
PARAMETER: dry weight palmito
EXPRESSED IN: total g in 4 plants

4a		4b		4c		
011:	34.73818	001:	35.45077	000:	29.57967	
020:	59.01634	010:	35.10483	021:	50.32045	
100:	63.93684	111:	80.06403	101:	49.72941	
121:	40.90061	120:	30.06431	110:	44.95837	
201:	39.4094	200:	13.44808	211:	45.10839	
210:	53.4165	221:	25.21092	220:	48.76006	
	291.4178		219.3429		268.4563	779.2171
IIIa		**IIIb**		**IIIc**		
010:	50.86664	000:	31.42215	001:	38.04561	
021:	43.97013	011:	46.01985	020:	68.02733	
101:	66.96986	110:	67.79428	100:	55.92282	
120:	64.83557	121:	31.19553	111:	101.1161	
200:	149.5212	201:	32.32092	210:	34.65052	
211:	54.56892	220:	29.95316	221:	77.17041	
	430.7323		238.7058		374.9327	1044.371
IIa		**IIb**		**IIc**		
010:	64.1785	001:	68.3046	000:	28.3349	
021:	33.43795	020:	41.49398	011:	52.00638	
100:	70.12843	110:	77.39573	101:	36.95795	
111:	54.68187	121:	96.69739	120:	29.64801	
201:	54.53155	200:	48.28197	210:	56.58372	
220:	58.18709	211:	41.95359	221:	94.40634	
	335.1453		374.1272		297.9373	1007.209
I.a		**I b**		**I c**		
011:	59.21	000:	24.77953	001:	59.87815	
020:	65.65944	021:	64.9073	010:	59.47327	
101:	60.45301	111:	61.88539	100:	82.55882	
110:	40.74018	120:	33.81055	121:	96.20403	
200:	38.06982	201:	54.85779	211:	29.43094	
221:	84.13636	210:	71.03447	220:	24.7365	
	348.2688		311.2750		352.2817	1011.825

3842.623

ANALYSIS OF VARIANCE: number of sprouts

SOURCE OF VARIATION	DEGREES OF FREEDOM		SUM OF SQUARES	MEAN SQUARES	F	5%	1%
REPLICATIONS	3		56.17	18.72	0.66	3.21	5.12
BLOCKS IN REPLICATION	8		245.11	30.64	1.08	2.17	2.95
N	2		281.03	140.51	4.94	3.22	5.13
P	2		148.36	74.18	2.61	3.22	5.13
K	1		3.56	3.56	0.12	4.06	7.25
N x P	4	* 7/8	238.37	59.59	2.09	2.58	3.76
N x K	2		83.53	41.76	1.47	3.22	5.13
P x K	2		97.69	48.85	1.72	3.22	5.13
N x P x K	4	* 5/8	327.62	81.91	2.88	2.58	3.79
ERROR	43		1223.85	28.46			
TOTAL	71		2705				

DATA FOR 3 x 3 x 2 FACTORIAL EXPERIMENT (CONFOUNDED)
PARAMETER: number of sprouts
EXPRESSED IN: number per four plants

Ia		Ib		Ic		
011:	22	001:	29	000:	24	
020:	26	010:	20	021:	35	
100:	30	111:	26	101:	30	
121:	18	120:	26	110:	28	
201:	22	200:	36	211:	25	
210:	29	221:	39	220:	22	
	147		176		164	487
IIa		**IIb**		**IIc**		
010:	23	000:	32	001:	15	
021:	28	011:	31	020:	31	
101:	29	110:	15	100:	34	
120:	34	121:	32	111:	25	
200:	38	201:	33	210:	35	
211:	23	220:	28	221:	43	
	175		171		183	529
IIIa		**IIIb**		**IIIc**		
010:	18	001:	22	000:	31	
021:	29	020:	18	011:	38	
100:	23	110:	28	101:	36	
111:	28	121:	34	120:	27	
201:	28	200:	31	210:	33	
220:	33	211:	32	221:	26	
	159		165		191	515
IVa		**IVb**		**IVc**		
011:	27	000:	19	001:	25	
020:	30	021:	21	010:	23	
101:	40	111:	19	100:	36	
110:	20	120:	29	121:	33	
200:	33	201:	27	211:	23	
221:	30	210:	37	220:	27	
	180		152		167	499

2030

TREATMENT TOTALS

	K0 P0	K0 P1	K0 P2	TOTAL	K1 P0	K1 P1	K1 P2	TOTAL
N0	106.00	84.00	105.00	295.00	91.00	118.00	113.00	322.00
N1	123.00	91.00	116.00	330.00	135.00	98.00	117.00	350.00
N2	138.00	134.00	110.00	382.00	110.00	103.00	138.00	351.00
TOTAL	367.00	309.00	331.00	1007.00	336.00	319.00	368.00	1023.00

2030.00

DATA FOR 3 x 3 x 2 FACTORIAL EXPERIMENT (CONFOUNDED)
PARAMETER: leaf area hijos
EXPRESSED IN: cm2 (mean of 4 plants)

Ia		Ib		Ic		
011:	306.5	001:	1070.75	000:	378.75	
020:	316.25	010:	253	021:	3041.75	
100:	2789	111:	555.5	101:	756	
121:	344.75	120:	744.75	110:	1115.5	
201:	375	200:	1096.25	211:	158.75	
210:	1296.5	221:	4214.75	220:	463.75	
	5428		7935		5914.5	19277.5

IIa		IIb		IIc		
010:	1292	000:	549	001:	337	
021:	1220	011:	1065	020:	726.75	
101:	2072.75	110:	1259.25	100:	1516.5	
120:	3919.25	121:	2938.75	111:	1175.25	
200:	1462	201:	964	210:	1183.5	
211:	1170.5	220:	1167.75	221:	6198.5	
	11136.5		7943.75		11137.5	30217.75

IIIa		IIIb		IIIc		
010:	289.75	001:	306.25	000:	479.25	
021:	1101.75	020:	181.75	011:	763	
100:	957	110:	683.75	101:	1715	
111:	2839	121:	887	120:	967.25	
201:	899.25	200:	675.25	210:	774.25	
220:	676.75	211:	934.75	221:	776.75	
	6763.5		3668.75		5475.5	15907.75

IVa		IVb		IVc		
011:	380	000:	58	001:	244	
020:	524.75	021:	818.5	010:	485.5	
101:	2656.75	111:	619.25	100:	1030.25	
110:	213.5	120:	531.25	121:	881.75	
200:	903	201:	1616	211:	335.25	
221:	597.25	210:	1199.75	220:	656.5	
	5275.25		4842.75		3633.25	13751.25

79154.25

ALYSIS OF VARIANCE:Leaf area of the sprouts

JRCE OF VARIATION	DEGREES OF FREEDOM		SUM OF SQUARES	MEAN SQUARES	F	5%	1%
PLICATIONS	3		8918832.48	2972944.16	3.28	3.21	5.12
OCKS IN REPLICATION	8		2769151.21	346143.90	0.38	2.17	2.95
	2		6733787.29	3366893.64	3.71	3.22	5.13
	2		3961112.72	1980556.36	2.18	3.22	5.13
	1		2538661.67	2538661.67	2.80	4.06	7.25
‹ P	4	* 7/8	2972903.71	743225.93	0.82	2.58	3.76
‹ K	2		538307.52	269153.76	0.30	3.22	5.13
‹ K	2		3661829.46	1830914.73	2.02	3.22	5.13
‹ P x K	4	* 5/8	5610554.52	1402638.63	1.55	2.58	3.79
ROR	43		39002788.29	907041.59			
TAL	71		76707929				

DATA FOR 3 x 3 x 2 FACTORIAL EXPERIMENT (CONFOUNDED)
PARAMETER: Hij N
EXPRESSED IN: % sobre base seca

Ia		Ib		Ic	
011:	1.88	001:	1.85	000:	1.82
020:	1.70	010:	1.88	021:	1.65
100:	2.19	111:	2.40	101:	1.53
121:	1.82	120:	1.93	110:	2.14
201:	2.11	200:	1.96	211:	1.90
210:	1.53	221:	2.05	220:	1.99
	0		0		0

IIa		IIb		IIc	
010:	1.67	000:	2.11	001:	2.16
021:	2.02	011:	1.88	020:	1.96
101:	1.62	110:	1.99	100:	1.88
120:	1.88	121:	1.67	111:	2.11
200:	1.67	201:	2.11	210:	1.85
211:	2.19	220:	2.31	221:	1.82
	0		0		0

IIIa		IIIb		IIIc	
010:	2.05	001:	1.82	000:	1.96
021:	1.93	020:	1.65	011:	2.25
100:	1.82	110:	1.67	101:	1.53
111:	1.96	121:	2.42	120:	2.37
201:	2.31	200:	2.34	210:	2.37
220:	2.05	211:	1.90	221:	2.48
	0		0		0

IVa		IVb		IVc	
011:	2.05	000:	1.82	001:	2.19
020:	2.08	021:	2.08	010:	2.16
101:	2.16	111:	2.05	100:	1.83
110:	1.99	120:	1.99	121:	1.73
200:	1.90	201:	2.25	211:	1.88
221:	1.96	210:	2.05	220:	2.08
	0		0		0

ANALYSIS OF VARIANCE:HIJ N , % sobre base seca

SOURCE OF VARIATION	DEGREES OF FREEDOM		SUM OF SQUARES	MEAN SQUARES	F	5%	1%
REPLICATIONS	3		0.23	0.08	1.54	3.21	5.12
BLOCKS IN REPLICATION	8		0.33	0.04	0.81	2.17	2.95
N	2		0.16	0.08	1.61	3.22	5.13
P	2		0.02	0.01	0.17	3.22	5.13
K	1		0.02	0.02	0.32	4.06	7.25
N x P	4	* 7/8	0.24	0.06	1.18	2.58	3.76
N x K	2		0.07	0.03	0.67	3.22	5.13
P x K	2		0.04	0.02	0.44	3.22	5.13
N x P x K	4	* 5/8	0.32	0.08	1.59	2.58	3.79
ERROR	43		2.16	0.05			
TOTAL	71		4				

DATA FOR 3 x 3 x 2 FACTORIAL EXPERIMENT (CONFOUNDED)
PARAMETER: HIJ P
EXPRESSED IN: % sobre base seca

Ia	Ib	Ic
011: 0.25	001: 0.22	000: 0.19
020: 0.24	010: 0.26	021: 0.30
100: 0.21	111: 0.26	101: 0.22
121: 0.24	120: 0.25	110: 0.25
201: 0.19	200: 0.27	211: 0.24
210: 0.23	221: 0.26	220: 0.24
0	0	0

IIa	IIb	IIc
010: 0.23	000: 0.24	001: 0.25
021: 0.26	011: 0.27	020: 0.26
101: 0.23	110: 0.25	100: 0.22
120: 0.22	121: 0.17	111: 0.25
200: 0.24	201: 0.22	210: 0.26
211: 0.16	220: 0.25	221: 0.23
0	0	0

IIIa	IIIb	IIIc
010: 0.23	001: 0.23	000: 0.25
021: 0.27	020: 0.22	011: 0.21
100: 0.22	110: 0.23	101: 0.20
111: 0.15	121: 0.20	120: 0.23
201: 0.20	200: 0.24	210: 0.24
220: 0.20	211: 0.22	221: 0.21
0	0	0

IVa	IVb	IVc
011: 0.22	000: 0.23	001: 0.22
020: 0.23	021: 0.25	010: 0.24
101: 0.22	111: 0.26	100: 0.21
110: 0.25	120: 0.23	121: 0.25
200: 0.23	201: 0.20	211: 0.24
221: 0.26	210: 0.19	220: 0.26
0	0	0

ANALYSIS OF VARIANCE:HIJ P , % sobre base seca

SOURCE OF VARIATION	DEGREES OF FREEDOM		SUM OF SQUARES	MEAN SQUARES	F	5%	1%
REPLICATIONS	3		0.00	0.00	2.44	3.21	5.12
BLOCKS IN REPLICATION	8		0.00	0.00	1.00	2.17	2.95
N	2		0.00	0.00	2.64	3.22	5.13
P	2		0.00	0.00	2.78	3.22	5.13
K	1		0.00	0.00	1.11	4.06	7.25
N x P	4	* 7/8	0.00	0.00	1.44	2.58	3.76
N x K	2		0.00	0.00	2.45	3.22	5.13
P x K	2		0.00	0.00	1.12	3.22	5.13
N x P x K	4	* 5/8	0.00	0.00	1.79	2.58	3.79
ERROR	43		0.02	0.00			
TOTAL	71		0				

DATA FOR 3 x 3 x 2 FACTORIAL EXPERIMENT (CONFOUNDED)
PARAMETER: HIJ K
EXPRESSED IN: % sobre base seca.

Ia	Ib	Ic
011: 2.25	001: 1.80	000: 1.79
020: 1.65	010: 2.09	021: 2.79
100: 1.43	111: 2.09	101: 1.88
121: 2.15	120: 1.95	110: 2.08
201: 1.61	200: 1.75	211: 2.23
210: 1.21	221: 2.33	220: 1.67
0	0	0

IIa	IIb	IIc
010: 1.33	000: 2.18	001: 2.02
021: 2.18	011: 2.50	020: 1.66
101: 2.12	110: 1.86	100: 1.99
120: 1.77	121: 1.38	111: 2.16
200: 1.86	201: 2.00	210: 1.84
211: 1.32	220: 2.04	221: 2.05
0	0	0

IIIa	IIIb	IIIc
010: 2.16	001: 2.15	000: 1.86
021: 2.13	020: 1.95	011: 2.04
100: 1.77	110: 1.88	101: 1.92
111: 1.62	121: 1.97	120: 2.07
201: 2.06	200: 1.90	210: 1.85
220: 1.54	211: 2.07	221: 1.78
0	0	0

IVa	IVb	IVc
011: 2.10	000: 2.08	001: 2.25
020: 1.77	021: 2.40	010: 1.73
101: 1.52	111: 2.04	100: 2.13
110: 2.02	120: 1.76	121: 1.94
200: 1.98	201: 1.99	211: 2.27
221: 2.19	210: 1.44	220: 1.86
0	0	0

ANALYSIS OF VARIANCE:HIJ K , % sobre base seca

SOURCE OF VARIATION	DEGREES OF FREEDOM		SUM OF SQUARES	MEAN SQUARES	F	5%	1%
REPLICATIONS	3		0.05	0.02	0.28	3.21	5.12
BLOCKS IN REPLICATION	8		0.42	0.05	0.90	2.17	2.95
N	2		0.27	0.14	2.36	3.22	5.13
P	2		0.00	0.00	0.03	3.22	5.13
K	1		0.59	0.59	10.12	4.06	7.25
N x P	4	* 7/8	0.13	0.03	0.55	2.58	3.76
N x K	2		0.42	0.21	3.59	3.22	5.13
P x K	2		0.24	0.12	2.07	3.22	5.13
N x P x K	4	* 5/8	0.18	0.05	0.79	2.58	3.79
ERROR	43		2.50	0.06			
TOTAL	71		5				

DATA FOR 3 x 3 x 2 FACTORIAL EXPERIMENT (CONFOUNDED)
PARAMETER: total length
EXPRESSED IN: cm (mean of 4 plants)

Ia		Ib		Ic		
011:	169	001:	174.5	000:	133.25	
020:	170.25	010:	181.25	021:	189.5	
100:	197.25	111:	173	101:	184.25	
121:	186.5	120:	176.75	110:	139	
201:	151.5	200:	166.75	211:	154.75	
210:	162.75	221:	176	220:	164.5	
	1037.25		1048.25		965.25	3050.75
IIa		IIb		IIc		
010:	166.75	000:	166	001:	166.25	
021:	147.75	011:	180	020:	162.5	
101:	163	110:	184.5	100:	178.25	
120:	209.25	121:	188.25	111:	165.5	
200:	176.25	201:	181.25	210:	189	
211:	157.5	220:	181	221:	238.75	
	1020.5		1081		1100.25	3201.75
IIIa		IIIb		IIIc		
010:	170.75	001:	157.75	000:	154.5	
021:	188.25	020:	182.25	011:	197.75	
100:	194	110:	192	101:	198.75	
111:	201.75	121:	154.25	120:	188.75	
201:	174.5	200:	171.75	210:	173	
220:	170.5	211:	178.5	221:	182.75	
	1099.75		1036.5		1095.5	3231.75
IVa		IVb		IVc		
011:	174	000:	139.75	001:	150.25	
020:	172.25	021:	170.75	010:	166.5	
101:	207.25	111:	201	100:	199.25	
110:	191	120:	172.75	121:	168.5	
200:	160.75	201:	182	211:	171.75	
221:	178	210:	188.25	220:	178	
	1083.25		1054.5		1034.25	3172
						12656.25

ANALYSIS OF VARIANCE: total length in cm

SOURCE OF VARIATION	DEGREES OF FREEDOM		SUM OF SQUARES	MEAN SQUARES	F	5%	1%
REPLICATIONS	3		1050.26	350.09	1.35	3.21	5.12
BLOCKS IN REPLICATION	8		1873.45	234.18	0.90	2.17	2.95
N	2		3061.08	1530.54	5.89	3.22	5.13
P	2		601.91	300.96	1.16	3.22	5.13
K	1		179.71	179.71	0.69	4.06	7.25
N x P	4	* 7/8	2630.01	657.50	2.53	2.58	3.76
N x K	2		357.72	178.86	0.69	3.22	5.13
P x K	2		24.15	12.07	0.05	3.22	5.13
N x P x K	4	* 5/8	985.54	246.38	0.95	2.58	3.79
ERROR	43		11182.91	260.07			
TOTAL	71		21947				

DATA FOR 3 x 3 x 2 FACTORIAL EXPERIMENT (CONFOUNDED)
PARAMETER: length until last leaf (mean of 4 plants)
EXPRESSED IN: cm

Ia		Ib		Ic		
011:	61.25	001:	62.25	000:	44.5	
020:	65	010:	65	021:	63.5	
100:	68.5	111:	61	101:	63.5	
121:	66.75	120:	63.5	110:	55	
201:	53.25	200:	61.75	211:	54.75	
210:	57	221:	68.75	220:	57.5	
	371.75		382.25		338.75	1092.75
IIa		IIb		IIc		
010:	60.25	000:	56	001:	54.5	
021:	44.75	011:	62	020:	52.5	
101:	57.75	110:	59	100:	67.75	
120:	65.5	121:	62.5	111:	54.25	
200:	61.25	201:	64.5	210:	60	
211:	56	220:	89	221:	74.25	
	345.5		393		363.25	1101.75
IIIa		IIIb		IIIc		
010:	55.5	001:	56.5	000:	55.75	
021:	58.5	020:	60	011:	69.5	
100:	66	110:	71.5	101:	67.5	
111:	68.75	121:	56.5	120:	64.75	
201:	56.5	200:	56	210:	54.25	
220:	58.25	211:	56	221:	67.25	
	363.5		356.5		379	1099
IVa		IVb		IVc		
011:	56.25	000:	56.75	001:	56.25	
020:	59.75	021:	54.75	010:	58.75	
101:	74	111:	72	100:	67.5	
110:	73.25	120:	60.5	121:	55.75	
200:	52.25	201:	65.25	211:	61	
221:	63.75	210:	67.5	220:	59.75	
	379.25		376.75		359	1115
						4408.5

ANALYSIS OF VARIANCE: Length until the last leaf petiole

SOURCE OF VARIATION	DEGREES OF FREEDOM		SUM OF SQUARES	MEAN SQUARES	F	5%	1%
REPLICATIONS	3		14.64	4.88	0.12	3.21	5.12
BLOCKS IN REPLICATION	8		448.60	56.07	1.37	2.17	2.95
N	2		491.72	245.86	6.00	3.22	5.13
P	2		46.52	23.26	0.57	3.22	5.13
K	1		0.42	0.42	0.01	4.06	7.25
N x P	4	* 7/8	644.29	161.07	3.93	2.58	3.76
N x K	2		26.95	13.47	0.33	3.22	5.13
P x K	2		28.50	14.25	0.35	3.22	5.13
N x P x K	4	* 5/8	57.13	14.28	0.35	2.58	3.79
ERROR	43		1763.45	41.01			
TOTAL	71		3522				

ATA FOR 3 x 3 x 2 FACTORIAL EXPERIMENT (CONFOUNDED)
ARAMETER: total fresh weight
XPRESSED IN: g

Ia		Ib		Ic		
011:	6538	001:	9577	000:	3508	
020:	5138.85	010:	7666	021:	8584	
100:	11857	111:	7200	101:	8482	
121:	8571	120:	7403	110:	6262	
201:	6310	200:	5140	211:	5201.84	
210:	5971	221:	8800	220:	7273	
	44385.85		45786		39310.84	129482.6
IIa		**IIb**		**IIc**		
010:	8137	000:	5526	001:	7073	
021:	5078	011:	7688	020:	6776	
101:	7719	110:	9178	100:	8713	
120:	10896	121:	11183	111:	7312	
200:	7594	201:	8617	210:	7592	
211:	5578	220:	8813	221:	14654	
	45002		51005		52120	148127
IIIa		**IIIb**		**IIIc**		
010:	6486	001:	5751	000:	6908	
021:	10000	020:	11690.9	011:	10014	
100:	9937	110:	9190	101:	10271	
111:	11222	121:	5032	120:	9528	
201:	7365	200:	7444	210:	6598	
220:	7393	211:	8793	221:	9533	
	52403		47900.9		52852	153155.9
IVa		**IVb**		**IVc**		
011:	5659	000:	5546.33	001:	4787	
020:	5848	021:	6188.68	010:	6066	
101:	11746	111:	8280	100:	9076	
110:	8539	120:	7513	121:	5836	
200:	5377	201:	8045	211:	7053	
221:	6714.63	210:	8404	220:	5727	
	43883.63		43977.01		38545	126405.6

557171.2

ALYSIS OF VARIANCE: total fresh weight

JRCE OF VARIATION	DEGREES OF FREEDO		SUM OF SQUARES	MEAN SQUARES	F	5%	1%
PLICATIONS	3		29585876.80	9861958.93	2.77	3.21	5.12
OCKS IN REPLICATION	8		14477184.49	1809648.06	0.51	2.17	2.95
	2		43702213.58	21851106.79	6.13	3.22	5.13
	2		4526173.81	2263086.90	0.63	3.22	5.13
	1		3441406.73	3441406.73	0.97	4.06	7.25
x P	4	* 7/8	32822168.80	8205542.20	2.30	2.58	3.76
x K	2		7547351.36	3773675.68	1.06	3.22	5.13
x K	2		1618644.06	809322.03	0.23	3.22	5.13
x P x K	4	* 5/8	7550234.89	1887558.72	0.53	2.58	3.79
ROR	43		153276686.93	3564574.11			
	71		298547941				

DATA FOR 3 x 3 x 2 FACTORIAL EXPERIMENT (CONFOUNDED)
PARAMETER: total dry weight of 4 plants
EXPRESSED IN: g

Ia		Ib		Ic		
011:	1506.879	001:	2231.056	000:	862.1386	
020:	1327.824	010:	2010.069	021:	1905.934	
100:	2486.924	111:	1721.782	101:	2281.922	
121:	2218.777	120:	1777.302	110:	1566.753	
201:	2410.972	200:	1389.471	211:	1365.507	
210:	1625.208	221:	2054.394	220:	1593.601	
	11576.58		11184.07		9575.855	32336.51
IIa		**IIb**		**IIc**		
010:	1985.128	000:	1414.499	001:	1570.232	
021:	1238.149	011:	1880.589	020:	1486.19	
101:	1770.973	110:	2325.08	100:	2151.834	
120:	1357.001	121:	2553.232	111:	1628.121	
200:	1808.304	201:	2245.29	210:	1724.548	
211:	1324.869	220:	2056.245	221:	3108.635	
	9484.424		12474.93		11669.56	33628.91
IIIa		**IIIb**		**IIIc**		
010:	1659.23	001:	1380.475	000:	1827.716	
021:	2157.695	020:	3091.261	011:	2379.398	
100:	2426.448	110:	2164.53	101:	2198.637	
111:	2769.462	121:	1127.489	120:	2213.989	
201:	1703.349	200:	1442.336	210:	1661.262	
220:	2211.116	211:	2168.43	221:	2202.503	
	12927.3		11374.52		12483.50	36785.32
IVa		**IVb**		**IVc**		
011:	2000.139	000:	1310.422	001:	1237.005	
020:	1697.438	021:	1515.235	010:	1493.368	
101:	2648.547	111:	1905.777	100:	2640.39	
110:	1957.151	120:	1889.93	121:	1597.496	
200:	1467.278	201:	2150.107	211:	1715.635	
221:	1691.348	210:	2314.928	220:	1542.91	
	11461.90		11086.39		10226.80	32775.10

135525.8

ANALYSIS OF VARIANCE: Total dry weight

SOURCE OF VARIATION	DEGREES OF FREEDOM		SUM OF SQUARES	MEAN SQUARES	F	5%	1%
REPLICATIONS	3		672616.54	224205.51	1.18	3.21	5.12
BLOCKS IN REPLICATION	8		1519624.50	189953.06	1.00	2.17	2.95
N	2		1407184.11	703592.05	3.71	3.22	5.13
P	2		12976.52	6488.26	0.03	3.22	5.13
K	1		180622.28	180622.28	0.95	4.06	7.25
N x P	4	* 7/8	2225461.05	556365.26	2.93	2.58	3.76
N x K	2		315338.82	157669.41	0.83	3.22	5.13
P x K	2		154661.07	77330.53	0.41	3.22	5.13
N x P x K	4	* 5/8	234777.34	58694.34	0.31	2.58	3.79
ERROR	43		8161091.85	189792.83			
TOTAL	71		14884354				

DATA FOR 3 x 3 x 2 FACTORIAL EXPERIMENT (CONFOUNDED)
PARAMETER: N opname
EXPRESSED IN: kg / ha

Ia	Ib	Ic
011:35,36	001:51,47	000:21,23
020:27,17	010:51,80	021:36,49
100:49,42	111:43,65	101:48,44
121:62,77	120:39,60	110:37,31
201:50,55	200:37,95	211:33,15
210:48,95	221:58,11	220:36,55

IIa	IIb	IIc
010:39,09	000:26,70	001:35,98
021:28,10	011:36,85	020:32,79
101:34,03	110:45,21	100:44,11
120:20,33	121:45,66	111:38,66
200:43,21	201:57,43	210:37,21
211:27,07	220:41,93	221:73,48

IIIa	IIIb	IIIc
010:34,95	001:28,40	000:61,52
021:48,81	020:77,29	011:53,89
100:47,27	110:48,51	101:45,95
111:40,39	121:24,21	120:52,80
201:40,27	200:33,49	210:34,94
220:44,83	211:43,06	221:45,99

IVa	IVb	IVc
011:42,97	000:34,79	001:30,58
020:37,29	021:31,10	010:30,67
101:64,06	111:41,18	100:59,54
110:37,11	120:43,65	121:57,31
200:32,93	201:50,28	211:40.89
221:39,95	210:50,28	220:35,56

ANALYSIS OF VARIANCE:N opname in kg / ha

SOURCE OF VARIATION	DEGREES OF FREEDOM		SUM OF SQUARES	MEAN SQUARES	F	5%	1%
REPLICATIONS	3		340.86	113.62	0.84	3.21	5.12
BLOCKS IN REPLICATION	8		1156.27	144.53	1.06	2.17	2.95
N	2		368.94	184.47	1.36	3.22	5.13
P	2		54.77	27.39	0.20	3.22	5.13
K	1		81.07	81.07	0.60	4.06	7.25
N x P	4	* 7/8	687.74	171.94	1.26	2.58	3.76
N x K	2		214.73	107.36	0.79	3.22	5.13
P x K	2		85.11	42.56	0.31	3.22	5.13
N x P x K	4	* 5/8	99.02	24.76	0.18	2.58	3.79
ERROR	43		5846.80	135.97			
TOTAL	71		8935				

DATA FOR 3 x 3 x 2 FACTORIAL EXPERIMENT (CONFOUNDED)
PARAMETER: P opname
EXPRESSED IN: kg/ha

Ia	Ib	Ic
011:3,94	001:4,64	000:1,66
020:3,18	010:5,78	021:3,98
100:5,13	111:4,41	101:4,39
121:4,86	120:4,36	110:3,31
201:4,44	200:2,83	211:2,03
210:3,01	221:4,68	220:3,34

IIa	IIb	IIc
010:4,61	000:2,21	001:3,30
021:2,57	011:4,84	020:3,33
101:3,33	110:4,37	100:3,85
120:3,41	121:4,99	111:3,49
200:3,97	201:5,10	210:3,92
211:2,33	220:4,20	221:7,27

IIIa	IIIb	IIIc
010:3,06	001:2,99	000:330
021:4,64	020:6,67	011:5,58
100:4,23	110:4,47	101:5,04
111:5,99	121:2,70	120:5,51
201:3,18	200:3,10	210:3,56
220:4,60	211:5,46	221:4,59

IVa	IVb	IVc
011:4,46	000:3,59	001:2,67
020:3,73	021:3,77	010:3,11
101:5,69	111:4,31	100:5,44
110:5,01	120:4,11	121:5,46
200:2,79	201:4,22	211:3,90
221:3,92	210:4,58	220:3,34

ANALYSIS OF VARIANCE:P opname in kg / ha

SOURCE OF VARIATION	DEGREES OF FREEDOM		SUM OF SQUARES	MEAN SQUARES	F	5%	1%
REPLICATIONS	3		2.07	0.69	0.70	3.21	5.12
BLOCKS IN REPLICATION	8		9.34	1.17	1.18	2.17	2.95
N	2		4.30	2.15	2.18	3.22	5.13
P	2		2.48	1.24	1.26	3.22	5.13
K	1		1.60	1.60	1.63	4.06	7.25
N x P	4	* 7/8	9.66	2.42	2.45	2.58	3.76
N x K	2		1.41	0.70	0.71	3.22	5.13
P x K	2		0.49	0.25	0.25	3.22	5.13
N x P x K	4	* 5/8	0.70	0.18	0.18	2.58	3.79
ERROR	43		42.38	0.99			
TOTAL	71		74				

DATA FOR 3 x 3 x 2 FACTORIAL EXPERIMENT (CONFOUNDED)
PARAMETER: K opname
EXPRESSED IN: kg/ha

Ia	Ib	Ic
011: 22,69	001: 27,75	000: 13,94
020: 17,96	010: 31,70	021: 31,70
100: 45,03	111: 26,22	101: 35,80
121: 41,38	120: 24,50	110: 28,12
201: 33,37	200: 10,33	211: 10,79
210: 24,08	221: 36,59	220: 21,75
0	0	0

IIa	IIb	IIc
010: 25,87	000: 26,56	001: 26,10
021: 17,68	011: 35,59	020: 20,68
101: 29,91	110: 27,55	100: 26,38
120: 28,41	121: 33,99	111: 24,00
200: 24,77	201: 29,20	210: 22,18
211: 19,82	220: 20,42	221: 55,06
0	0	0

IIIa	IIIb	IIIc
010: 24,81	001: 18,36	000: 21,88
021: 35,69	020: 38,01	011: 37,10
100: 24,43	110: 30,71	101: 36,99
111: 26,99	121: 21,32	120: 32,36
201: 27,38	200: 20,12	210: 19,60
220: 21,53	211: 31,77	221: 32,21
0	0	0

IVa	IVb	IVc
011: 27,52	000: 19,38	001: 21,17
020: 21,90	021: 26,99	010: 22,03
101: 45,78	111: 30,22	100: 35,63
110: 24,18	120: 24,10	121: 25,27
200: 20,00	201: 34,44	211: 23,65
221: 24,40	210: 26,85	220: 17,27
0	0	0

ANALYSIS OF VARIANCE:K opname in kg / ha

SOURCE OF VARIATION	DEGREES OF FREEDOM		SUM OF SQUARES	MEAN SQUARES	F	5%	1%
REPLICATIONS	3		26.65	8.88	0.19	3.21	5.12
BLOCKS IN REPLICATION	8		258.18	32.27	0.69	2.17	2.95
N	2		343.95	171.98	3.68	3.22	5.13
P	2		31.40	15.70	0.34	3.22	5.13
K	1		502.50	502.50	10.76	4.06	7.25
N x P	4	* 7/8	571.06	142.76	3.06	2.58	3.76
N x K	2		185.98	92.99	1.99	3.22	5.13
P x K	2		101.34	50.67	1.09	3.22	5.13
N x P x K	4	* 5/8	66.21	16.55	0.35	2.58	3.79
ERROR	43		2007.74	46.69			
TOTAL	71		4095				

APPENDIX 4:

Data and ANOVA tables of the time series

number of sprouts

treatments: 1		1 0-0-0	2 0-1-0	3 0-2-1	4 1-0-0	5 1-1-1	6 2-0-1	7 2-2-0	8 2-2-1	total
blocks:	1	0	0	0	0	0	0	0.25	0.25	0.5
	2	0	0	0.25	0.25	1.25	0	0	0	1.75
	3	0	0	0	0.25	0	0	0.5	0.5	1.25
	4	0	0	0	0	0	1	0.25	0	1.25
treatment totals:		0	0	0.25	0.5	1.25	1	1	0.75	4.75

ANOVA:

	Dim	SS	MS	f	F(0.05)	F(0.01)	yes(0.05)	yes(0.01)
Niveau	1	0.705078						
Blocks	3	0.099609	0.033203	0.312883	3.07	4.87	0	0
Treatments	7	0.404296	0.057756	0.544259	2.49	3.65	0	0
Remainder	21	2.228515	0.106119					

treatments: 2		1 0-0-0	2 0-1-0	3 0-2-1	4 1-0-0	5 1-1-1	6 2-0-1	7 2-2-0	8 2-2-1	total
blocks:	1	1	0.25	0.75	0.75	0.75	0.75	0.5	0.75	5.5
	2	0.25	0.75	0.25	0.75	2.75	0	0.5	0.25	5.5
	3	1	0.75	1.5	1	0.25	0.75	1.5	0	6.75
	4	0	0.25	0.25	1	0.5	3	0.5	0.25	5.75
treatment totals:		2.25	2	2.75	3.5	4.25	4.5	3	1.25	23.5

ANOVA:

	Dim	SS	MS	f	F(0.05)	F(0.01)	yes(0.05)	yes(0.01)
Niveau	1	17.25781						
Blocks	3	0.132812	0.044270	0.077122	3.07	4.87	0	0
Treatments	7	2.179687	0.311383	0.542449	2.49	3.65	0	0
Remainder	21	12.05468	0.574032					

treatments: 3		1 0-0-0	2 0-1-0	3 0-2-1	4 1-0-0	5 1-1-1	6 2-0-1	7 2-2-0	8 2-2-1	total
blocks:	1	1.25	0.75	1.5	1.75	1	1.25	0.5	3.25	11.25
	2	1	2	0.5	1	3.5	0.25	0.75	1	10
	3	1.5	0.75	3.25	1	0.75	1	3.25	1	12.5
	4	0.25	0.5	0.5	1	0.5	4	1.5	0.5	8.75
treatment totals:		4	4	5.75	4.75	5.75	6.5	6	5.75	42.5

ANOVA:

	Dim	SS	MS	f	F(0.05)	F(0.01)	yes(0.05)	yes(0.01)
Niveau	1	56.44531						
Blocks	3	0.976562	0.325520	0.229598	3.07	4.87	0	0
Treatments	7	1.554687	0.222098	0.156651	2.49	3.65	0	0
Remainder	21	29.77343	1.417782					

treatments: 4		1 0-0-0	2 0-1-0	3 0-2-1	4 1-0-0	5 1-1-1	6 2-0-1	7 2-2-0	8 2-2-1	total
blocks:	1	1.5	1.75	2.25	4.25	1.5	2	0.75	4	18
	2	2.25	2.25	1.25	2.25	4	1.5	1.5	1.25	16.25
	3	2.25	1.5	3.5	2.25	1	1.75	4.5	2	18.75
	4	1.25	0.5	1.75	2	1.75	5	2	0.75	15
treatment totals:		7.25	6	8.75	10.75	8.25	10.25	8.75	8	68

ANOVA:

	Dim	SS	MS	f	F(0.05)	F(0.01)	yes(0.05)	yes(0.01)
Niveau	1	144.5						
Blocks	3	1.078125	0.359375	0.216689	3.07	4.87	0	0
Treatments	7	4.09375	0.584821	0.352624	2.49	3.65	0	0
Remainder	21	34.82812	1.658482					

(number of sprouts)

treatments: 5		1 0-0-0	2 0-1-0	3 0-2-1	4 1-0-0	5 1-1-1	6 2-0-1	7 2-2-0	8 2-2-1	total
blocks:	1	2	2.25	2	6	2.75	2.5	1.25	4.75	23.5
	2	2.75	3	2.25	3.5	4.5	2.75	2	2.5	23.25
	3	3	3	4.25	2.75	3	3.25	5.5	2.75	27.5
	4	1.75	1	1.75	3	3.25	6.5	2.5	0.75	20.5
treatment totals:		9.5	9.25	10.25	15.25	13.5	15	11.25	10.75	94.75

ANOVA:

	Dim	SS	MS	f	F(0.05)	F(0.01)	yes(0.05)	yes(0.01)
Niveau	1	280.5488						
Blocks	3	3.115234	1.038411	0.520828	3.07	4.87	0	0
Treatments	7	10.15429	1.450613	0.727573	2.49	3.65	0	0
Remainder	21	41.86914	1.993768					

treatments: 6		1 0-0-0	2 0-1-0	3 0-2-1	4 1-0-0	5 1-1-1	6 2-0-1	7 2-2-0	8 2-2-1	total
blocks:	1	2.25	3	3.25	6.5	4	3.5	1.75	6	30.25
	2	4.25	5.25	3.25	5.25	5.5	3	3.75	4.25	34.5
	3	3.25	4.5	4	2.25	3.75	4	5.25	3.5	30.5
	4	2.5	1.25	2.5	4.5	4.25	7	4.25	1.25	27.5
treatment totals:		12.25	14	13	18.5	17.5	17.5	15	15	122.75

ANOVA:

	Dim	SS	MS	f	F(0.05)	F(0.01)	yes(0.05)	yes(0.01)
Niveau	1							
Blocks	3	3.115234	1.038411	0.445086	3.07	4.87	0	0
Treatments	7	9.091796	1.298828	0.556707	2.49	3.65	0	0
Remainder	21	48.99414	2.333054					

treatments: 2

blocks:		1 0-0-0	2 0-1-0	3 0-2-1	4 1-0-0	5 1-1-1	6 2-0-1	7 2-2-0	8 2-2-1	total
	1	23.4	15.6	18.3	17.9	13.9	0.2	-9.3	12.3	92.3
	2	9.1	18.9	22.1	28.9	9.7	8.1	4.6	18.3	119.7
	3	8.9	12.7	15.8	14.7	26.2	10.7	15.4	12.7	117.1
	4	17.2	6.9	18.3	32	21.3	18.2	0.1	8.9	122.9
treatment totals:		58.6	54.1	74.5	93.5	71.1	37.2	10.8	52.2	452

ANOVA:

	Dim	SS	MS	f	F(0.05)	F(0.01)	yes(0.05)	yes(0.01)
Niveau	1	6384.5						
Blocks	3	73.525	24.50833	0.480212	3.07	4.87	0	0
Treatments	7	1098.95	156.9928	3.076094	2.49	3.65	1	0
Remainder	21	1071.765	51.03642					
Total	32	8628.74						

treatments: 3

blocks:		1 0-0-0	2 0-1-0	3 0-2-1	4 1-0-0	5 1-1-1	6 2-0-1	7 2-2-0	8 2-2-1	total
	1	26	30.5	31.3	32.8	15.7	41.6	10.2	44.1	232.2
	2	24.4	32.5	21.6	26.1	27.5	29	25.6	29.5	216.2
	3	31.5	35	21.5	20.1	27.2	23.1	37.4	22.6	218.4
	4	29.3	35.4	30.9	21	21.8	19.2	23.8	16.9	198.3
treatment totals:		111.2	133.4	105.3	100	92.2	112.9	97	113.1	865.1

ANOVA:

	Dim	SS	MS	f	F(0.05)	F(0.01)	yes(0.05)	yes(0.01)
Niveau	1	23387.43						
Blocks	3	72.65343	24.21781	0.381554	3.07	4.87	0	0
Treatments	7	286.7996	40.97138	0.645509	2.49	3.65	0	0
Remainder	21	1332.899	63.47138					
Total	32	25079.79						

treatments: 4

blocks:		1 0-0-0	2 0-1-0	3 0-2-1	4 1-0-0	5 1-1-1	6 2-0-1	7 2-2-0	8 2-2-1	total
	1	30.4	17.1	27.4	34.1	20.8	31.9	41.9	30.3	233.9
	2	27.6	34.2	29.3	33.3	30.6	34.6	10.9	28.3	228.8
	3	34.3	28.2	26.6	27.1	33.9	45.6	31.6	44.3	271.6
	4	23.6	29.6	24.6	41.2	31.3	36.4	32.3	37.4	256.4
treatment totals:		115.9	109.1	107.9	135.7	116.6	148.5	116.7	140.3	990.7

ANOVA:

	Dim	SS	MS	f	F(0.05)	F(0.01)	yes(0.05)	yes(0.01)
Niveau	1	30671.45						
Blocks	3	149.3184	49.77281	0.989159	3.07	4.87	0	0
Treatments	7	414.3746	59.19638	1.176438	2.49	3.65	0	0
Remainder	21	1056.684	50.31828					
Total	32	32291.83						

treatments: 5

blocks:		1 0-0-0	2 0-1-0	3 0-2-1	4 1-0-0	5 1-1-1	6 2-0-1	7 2-2-0	8 2-2-1	total
	1	14.6	28.4	37.6	43.1	50.2	38.8	48.1	26.2	287
	2	31.8	26.8	22.1	38.3	38.1	27.6	61.5	36.4	282.6
	3	38.4	30.7	20.4	32.3	35	48.5	38.2	45	288.5
	4	44.2	32.2	34.9	33.4	32.9	44.1	39.4	30.3	291.4
treatment totals:		129	118.1	115	147.1	156.2	159	187.2	137.9	1149.5

ANOVA:

	Dim	SS	MS	f	F(0.05)	F(0.01)	yes(0.05)	yes(0.01)
Niveau	1	41292.19						
Blocks	3	5.050937	1.683645	0.019877	3.07	4.87	0	0
Treatments	7	1005.732	143.6760	1.696282	2.49	3.65	0	0
Remainder	21	1778.711	84.70055					
Total	32	44081.69						

treatments: 6

blocks:		1 0-0-0	2 0-1-0	3 0-2-1	4 1-0-0	5 1-1-1	6 2-0-1	7 2-2-0	8 2-2-1	total
	1	55.1	34.9	30.5	29.3	36.7	40	53.2	45.7	325.4
	2	39.5	46.3	44.1	41.8	51.6	43	43.9	39	349.2
	3	39.2	46.6	50.7	44.5	51	28.5	34	41.8	336.3
	4	29.1	22	40.9	29.2	25.2	37.1	47.6	39.5	270.6
treatment totals:		162.9	149.8	166.2	144.8	164.5	148.6	178.7	166	1281.5

ANOVA:

	Dim	SS	MS	f	F(0.05)	F(0.01)	yes(0.05)	yes(0.01)
Niveau	1	51320.07						
Blocks	3	448.4109	149.4703	2.044309	3.07	4.87	0	0
Treatments	7	229.3871	32.76959	0.448190	2.49	3.65	0	0
Remainder	21	1535.421	73.11531					
Total	32	53533.29						

treatments: 1		1 0-0-0	2 0-1-0	3 0-2-1	4 1-0-0	5 1-1-1	6 2-0-1	7 2-2-0	8 2-2-1	total
blocks:	1	69.75	62.5	70	74.25	48.25	68.5	47.75	71.25	512.25
	2	61.75	60	64.75	67	62	60.5	64.75	59.25	500
	3	66.25	69	64.25	66	74	64.25	74.25	67.25	545.25
	4	70.25	72.5	73	62.5	69.5	69.25	66.5	62.75	546.25
treatment totals:		268	264	272	269.75	253.75	262.5	253.25	260.5	2103.75

ANOVA:

	Dim	SS	MS	f	F(0.05)	F(0.01)	yes(0.05)	yes(0.01)
Niveau	1	138305.1						
Blocks	3	205.7089	68.56966	1.510096	3.07	4.87	0	0
Treatments	7	84.91992	12.13141	0.267167	2.49	3.65	0	0
Remainder	21	953.5566	45.40745					
Total	32	139549.3						

treatments: 2		1 0-0-0	2 0-1-0	3 0-2-1	4 1-0-0	5 1-1-1	6 2-0-1	7 2-2-0	8 2-2-1	total
blocks:	1	81.25	62.25	82	79	53	76.75	48.5	74	556.75
	2	65.25	67.75	73.5	75.75	71.5	66.5	66.75	69	556
	3	81.5	73.75	69.25	74	84	74.5	81.5	78.5	617
	4	80.75	76.5	81	74.5	78.75	74.5	71	68.75	605.75
treatment totals:		308.75	280.25	305.75	303.25	287.25	292.25	267.75	290.25	2335.5

ANOVA:

	Dim	SS	MS	f	F(0.05)	F(0.01)	yes(0.05)	yes(0.01)
Niveau	1	170455.0						
Blocks	3	386.0703	128.6901	2.082958	3.07	4.87	0	0
Treatments	7	336.9921	48.14174	0.779214	2.49	3.65	0	0
Remainder	21	1297.429	61.78236					
Total	32	172475.5						

treatments: 3		1 0-0-0	2 0-1-0	3 0-2-1	4 1-0-0	5 1-1-1	6 2-0-1	7 2-2-0	8 2-2-1	total
blocks:	1	90	84.5	94.75	94.75	61	90.75	54.25	89.5	659.5
	2	81.5	75.75	82.5	84	79	74	74.25	81.25	632.25
	3	92.25	86.25	74.5	84.25	91	85.5	95.5	90.25	699.5
	4	93.25	89	93	84.75	83.75	86.75	81.75	73.25	685.5
treatment totals:		357	335.5	344.75	347.75	314.75	337	305.75	334.25	2676.75

ANOVA:

	Dim	SS	MS	f	F(0.05)	F(0.01)	yes(0.05)	yes(0.01)
Niveau	1	223905.9						
Blocks	3	330.3964	110.1321	1.197847	3.07	4.87	0	0
Treatments	7	502.6855	71.81222	0.781062	2.49	3.65	0	0
Remainder	21	1930.775	91.94168					
Total	32	226669.8						

treatments: 4		1 0-0-0	2 0-1-0	3 0-2-1	4 1-0-0	5 1-1-1	6 2-0-1	7 2-2-0	8 2-2-1	total
blocks:	1	98.25	91.75	107	108.5	73.5	101.25	62	98.75	741
	2	90.5	86	89.25	93.5	95.75	86	87.5	90.25	718.75
	3	99	101.75	84	98	104.75	94.75	110.25	104.5	797
	4	108	96.5	104	92	95.5	98.25	95	84.5	773.75
treatment totals:		395.75	376	384.25	392	369.5	380.25	354.75	378	3030.5

ANOVA:

	Dim	SS	MS	f	F(0.05)	F(0.01)	yes(0.05)	yes(0.01)
Niveau	1	286997.8						
Blocks	3	449.7578	149.9192	1.261217	3.07	4.87	0	0
Treatments	7	291.6796	41.66852	0.350542	2.49	3.65	0	0
[illegible]	21	2496.242	118.8686					

..l length)

treatments: 5		1 0-0-0	2 0-1-0	3 0-2-1	4 1-0-0	5 1-1-1	6 2-0-1	7 2-2-0	8 2-2-1	total
blocks:	1	108.25	98.75	116.5	120.25	87.25	112.5	73.25	115.5	832.25
	2	99.75	95	99	107.75	108.75	96	98.75	98	803
	3	112.25	111	94.25	110	118.25	108.75	120.5	118.25	893.25
	4	114.5	103.5	116.75	102.5	107.5	106.25	108.25	99.25	858.5
treatment totals:		434.75	408.25	426.5	440.5	421.75	423.5	400.75	431	3387

ANOVA:

	Dim	SS	MS	f	F(0.05)	F(0.01)	yes(0.05)	yes(0.01)
Niveau	1	358492.7						
Blocks	3	553.0781	184.3593	1.550605	3.07	4.87	0	0
Treatments	7	308.4687	44.06696	0.370637	2.49	3.65	0	0
Remainder	21	2496.796	118.8950					
Total	32	361851.1						

treatments: 6		1 0-0-0	2 0-1-0	3 0-2-1	4 1-0-0	5 1-1-1	6 2-0-1	7 2-2-0	8 2-2-1	total
blocks:	1	123.5	117	137.5	140	99.5	130.5	89	136.25	973.25
	2	118	114	116	127.5	122.75	111.75	119.75	115.25	945
	3	128.75	133.75	112	130.5	141	129.75	138.75	142.5	1057
	4	134	125.25	130.25	122.5	128.75	130.25	124.5	113	1008.5
treatment totals:		504.25	490	495.75	520.5	492	502.25	472	507	3983.75

ANOVA:

	Dim	SS	MS	f	F(0.05)	F(0.01)	yes(0.05)	yes(0.01)
Niveau	1	495945.7						
Blocks	3	874.4746	291.4915	1.891352	3.07	4.87	0	0
Treatments	7	356.3574	50.90820	0.330319	2.49	3.65	0	0
Remainder	21	3236.478	154.1180					
Total	32	500413.0						

...parameters: $LA(t) = LA(t_0) + t^2 * M$

...f area (in cm^2)

$LA(t)$ = Leaf Area at time t

$LA(t_0)$ = Leaf Area at time t_0

t = time of measurement

$t = \{1, 2, 3, 4, 5, 6\}$

t_0 = three weeks before the first measurement

measurements every three weeks

M = Multiplication factor

treatments: $LA(t_0)$		1 0-0-0	2 0-1-0	3 0-2-1	4 1-0-0	5 1-1-1	6 2-0-1	7 2-2-0	8 2-2-1	total
blocks:	1	3008	2600	2988	2903	1563	2526	1091	2731	19410
	2	2453	2131	2670	2413	2300	2185	1857	2201	18210
	3	2393	2572	2388	2470	2515	2147	2806	2379	19670
	4	2877	2659	2943	2229	3078	2692	2138	2084	20700
treatment totals:		10731	9962	10989	10015	9456	9550	7892	9395	77990

ANOVA:

	Dim	SS	MS	f	F(0.05)	F(0.01)	yes(0.05)	yes(0.01)
Niveau	1							
Blocks	3	392634.3	130878.1	0.746868	3.07	4.87	0	0
Treatments	7	1579315.	225616.5	1.287503	2.49	3.65	0	0
Remainder	21	3679950.	175235.7					
Total	32	2.0E+08						

treatments: M		1 0-0-0	2 0-1-0	3 0-2-1	4 1-0-0	5 1-1-1	6 2-0-1	7 2-2-0	8 2-2-1	total
blocks:	1	230.6	160.7	246.1	288	125.8	257.1	115.4	261.2	1684.9
	2	184.6	204.1	191	259.1	245.8	184	174.3	199.3	1642.2
	3	237.7	239.6	166.3	194.4	292	233.3	273.5	295	1931.8
	4	237.3	177.5	255.7	197.5	211.5	271.7	202.7	160.1	1714
treatment totals		890.2	781.9	859.1	939	875.1	946.1	765.9	915.6	6972.9

ANOVA:

	Dim	SS	MS	f	F(0.05	F(0.01	yes(0.05	yes(0.01
Niveau	1	1519416						
Blocks	3	6252.81	2084.27	0.80390	3.07	4.87	0	0
Treatments	7	7940.51	1134.35	0.43752	2.49	3.65	0	0
Remainder	21	54446.4	2592.68					
Total	32	1588056						

... of green leaves at 10th measurement

treatments:		1	2	3	4	5	6	7	8	total
		0-0-0	0-1-0	0-2-1	1-0-0	1-1-1	2-0-1	2-2-0	2-2-1	
blocks:	1	8.5	8	8.75	9.25	8.5	9	6.5	7.5	66
	2	9	8.25	8.75	8.25	9	7	7.5	8.25	66
	3	8.75	8.75	8.5	8.25	9	7.75	9.25	8.75	69
	4	8.75	9.75	8.75	8	9	8.75	8.25	9	70.25
treatment totals:		35	34.75	34.75	33.75	35.5	32.5	31.5	33.5	271.25

ANOVA:

	Dim	SS	MS	f	F(0.05)	F(0.01)	yes(0.05)	yes(0.01)
Niveau	1	2299.267						
Blocks	3	1.740234	0.580078	1.313329	3.07	4.87	0	0
Treatments	7	3.279296	0.468470	1.060644	2.49	3.65	0	0
Remainder	21	9.275390	0.441685					
Total	32	2313.562						

...mber of new formed leaves since first measurement (at 6th measurement)

treatments:		1	2	3	4	5	6	7	8	total
		0-0-0	0-1-0	0-2-1	1-0-0	1-1-1	2-0-1	2-2-0	2-2-1	
blocks:	1	4.5	4.25	4.25	5.75	5.75	5.5	4.5	5	39.5
	2	4.5	4.75	5	5	4.5	5	4.75	4.5	38
	3	5	5	5	5	4.5	5	5	4.5	39
	4	4.5	4	4.5	4.5	5	5.25	5.25	5	38
treatment totals:		18.5	18	18.75	20.25	19.75	20.75	19.5	19	154.5

ANOVA:

	Dim	SS	MS	f	F(0.05)	F(0.01)	yes(0.05)	yes(0.01)
Niveau	1	745.9453						
Blocks	3	0.210937	0.070312	0.409978	3.07	4.87	0	0
Treatments	7	1.492187	0.213169	1.242950	2.49	3.65	0	0
Remainder	21	3.601562	0.171502					
Total	32	751.25						

% of leaf area increase since first measurement (at 6th measurement)

treatments:		1	2	3	4	5	6	7	8	total
		0-0-0	0-1-0	0-2-1	1-0-0	1-1-1	2-0-1	2-2-0	2-2-1	
blocks:	1	260.5	206.2	255.3	288.3	226.6	263.8	221.9	288.2	2010.8
	2	222	292.2	237.7	324.5	282.5	242.4	238.7	272.5	2112.5
	3	270.5	273.8	223.4	235	337.8	278.7	286.7	309.7	2215.6
	4	249	202.3	267	288.6	222.7	279.5	237.3	218	1964.4
treatment totals:		1002	974.5	983.4	1136.4	1069.6	1064.4	984.6	1088.4	8303.3

ANOVA:

	Dim	SS	MS	f	F(0.05)	F(0.01)	yes(0.05)	yes(0.01)
Niveau	1	2154524.						
Blocks	3	4690.735	1563.578	1.318233	3.07	4.87	0	0
Treatments	7	6269.787	895.6838	0.755139	2.49	3.65	0	0
Remainder	21	24908.45	1186.116					