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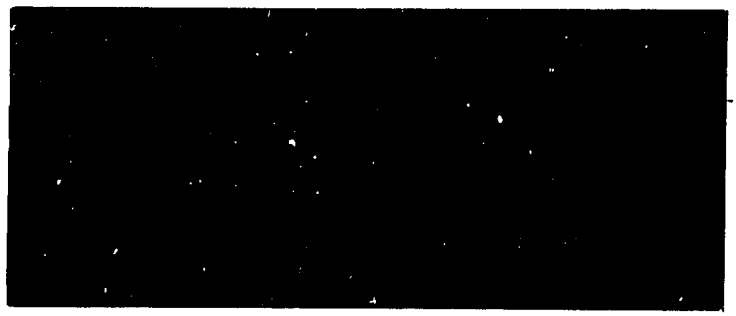

MASI

Multinational Agribusiness Systems Incorporated

PARAGUAY

MINIFUNDIA CROP INTENSIFICATION PROJECT

HORTICULTURAL REPORT

USAID-CREDICOOP-MASI

Work performed under contract LAC-0118-C-00-1026-00

July 22, 1981

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I. INTRODUCTION

The goal of the project is to increase the net cash income of participating small farmers in minifundia areas of the central zone of Paraguay. One main objective is to increase the production of food crops with high labor requirements and to reduce their marketing constraints. Another objective is to promote the processing and export of traditional crops, as well as other food crops. The project's purpose is to establish within CREDICOOP LTDA. (Central Cooperativa Nacional), an agribusiness complex to promote and finance the supply of inputs and, consequently, the production, processing, distribution and export of labor-intensive food crops such as tomatoes, strawberries, bananas and pineapples, in the minifundia areas.

This report will include information on research results collected over the past twenty years, which were used to develop the information for production activities. A section will be included on the use of audio-visual aids for training personnel. Comments also will be made on logistical support, as well as personnel. Recommendations will be included based on my observations made over a short period of about two months.

II. RESEARCH

The Ministry of Agriculture and Livestock assigned Ing. Agr. Gerardo Lopez A. to work with CREDICOOP on the Minifundia Crop Intensification Project; however, one week after I arrived, he resigned from the Ministry of Agriculture and Livestock. The Ministry of Agriculture and Livestock then assigned Ing. Agr. Jose Bertoni to replace Ing. Lopez, and to provide assistance in the field of research to the project. Unfortunately, the Ministry of Agriculture and Livestock has not been able to provide Ing. Bertoni with a vehicle; therefore, it is difficult for him to visit the farmers in order to assist them in resolving their production problems.

In order to establish an effective production program, it is absolutely essential that it is based on reliable research information obtained over a period of years. A review was made of the research base over a period of the last twenty years. This proved to be a difficult task since annual reports were not available for review. A meeting was held with Mr. Luis Alberto Alvarez, the Director of Research, Extension and Forestry, of the Ministry of Agriculture, and he indicated that most of the research in recent years was focused on plant breeding and problems pertaining to cotton, since that is the export crop of prime importance. The Director showed two movies on banana production and marketing which were made in the Caribbean area, and he pointed out that these would not be suitable as visual aid tools for use in Paraguay. It

would be desirable, however, for Mr. Dawson and Mr. Wong to see the movies before they videotape the banana project.

When I reviewed all of the experiments on tomatoes, strawberries and bananas at the Instituto Agronomico Nacional (I.A.N.), I noticed that border rows were not used in any of the experimental designs. I asked why border rows had not been used and was informed that the statistician at I.A.N. does not believe that they are necessary. It is extremely important to use border rows in all experiments that use a randomized block design to offset the effect of plant competition. It must be stressed that border rows be used in future experiments.

Another problem that I noticed is that many of the experiments are planted on beds, and the area for the plot is indicated only for the bed size and does not take into account the walkways between beds. In the future the plot size should include both the bed and half of the walkway so that when conversions are made to tons per hectare, the figures are realistic.

The experimental design for each experiment is very important in order to obtain reliable research data. The experiments should be of a simple design that can be used by extension personnel, whether or not they have been exposed to advanced courses in statistics and biometrics. I have included experimental designs in detail for experiments that should be conducted next year, in order to obtain data on which to base the recommendations for cultural practices in

the future. As soon as research results indicate new cultural techniques, the flip books (included with this report) should be revised to reflect the new information obtained through the extension trials.

The flip books are comprised of a series of pictures that indicate the best cultural practices to use; therefore, as new research information is generated, it is simple to change one or two pictures (or, as many as necessary) with accompanying narration, to indicate the improved practices which have been obtained through the use of the trials.

Annexes 1 through 10 provide ideas as to which trials should be conducted in the near future, in order to provide valuable information to the farmers. The results of these trials will suggest changes for future trials.

Personnel must be trained to establish the trials correctly and to take notes during the growing season on pest symptoms, as well as possible nutrient deficiencies. At harvest time the commodities should be classified for the market and weighed according to grades. This will provide information for an economic analysis at a later date. Information should be taken lso on the time required to apply fertilizers and sprays, so that the data will be available for an economic analysis.

It would be beneficial to conduct all of the fertilizer trials on farms since they will provide immediate and appropriate information for the farmers. The experiments that need reliable control, such as pesticide trials, could be conducted at the I.A.N. Pruning experiments on bananas could be carried out on the farms in order to save time, since farmers already are in banana production.

A farmers' field day should be held at harvest time in each area that has an extension trial, so that the farmers can see the results from each treatment.

I would like to include a quote from the report of the Ministry of Agriculture and Livestock on the Research project and Multiplication of Plant Material for 1980 (translated to English): "It will be necessary to repeat the experiments for 3 to 5 years to obtain more results to have a better grade of confidence." I agree with this statement and I would like to suggest that the part of the project that deals with bananas and pineapples move rather slowly in the next few years, until more research information is available on which to base recommendations for production.

A. Tomatoes

In 1961 seed of forty-seven tomato varieties was imported from the United States and planted in an observation trial. The most promising varieties were selected in 1961 and 1962, based on disease resistance and adaptation to local environmental

conditions. Sixteen of the selected varieties were planted in 1963 and 1964. The highest yielding varieties were J. Moran, Early Pack No. 7 and Pearson. Another variety trial was conducted in 1965, the results of which indicated that J. Moran and Pearson were the highest yielding varieties. A variety trial also was conducted in 1967 with seventeen varieties, and Burpee's Globe was the highest yielding variety, while Oxheart was second.

A variety trial was conducted in 1969 which included two breeding lines. The highest yielding varieties and lines were Roma, B1 and B2. In a trial conducted in 1970 the best varieties were Roma, Santa Cruz and Santa Cruz "Gigante". An observation trial was conducted in 1976, in which the best varieties were Ace Royal, Manalucie, Homestead 500, 6718 VF and an F_1 hybrid.

A variety trial was conducted at the Instituto Agronomico Nacional (I.A.N.) at Caacupe in 1980. The yield results were as follows:

Variety	Kg./Plot
Platense 2	58.92
Platense 1	58.25
F.R. - 1	55.27
Nozomi	54.60
Red 31	44.82
Call Ace	25.75

Another variety trial was conducted at Yaguaron in 1980, as well as one at Quiindy (also 1980), and the yield results were as follows:

Variety	Yaguaron (kg./plot)	Quiindy (kg./plot)
Platense	49	45
Nozomi	46	50
Homestead	42	51
Santa Cruz	45	48
Call Ace	46	34

Information was recorded on the size and quality of the fruits. CREDICOOP decided not to use Platense because of the variation in the size of the fruit, which made classification by grades very difficult. Nozomi and Santa cruz were selected for the project because the fruit size did not vary much and they had good production as well. Both also were tolerant to transporting over rough roads. Nozomi is early and produces about 40 days after transplanting.

Mr. Blair Cooper of the United States Agency for International Development ordered seed of varieties and plant introduction lines to test for frost tolerance. I designed an experimental design for planting them in 1981, as well as 1982, to determine whether any of the varieties or lines are tolerant to frost. The experimental design is included as Annex 1.

Septoria leaf spot and virus diseases are very serious in Paraguay. I requested MASI to obtain seed of varieties resistant to these diseases, which should be included in variety trials next year in order to determine their resistance to the diseases, fruit quality and yield potential.

Figure 1 shows a tomato leaf with symptoms of Septoria leaf spot. This disease is spread by wind and rain, and results in lower yields of tomatoes.

Fig. 1. Symptoms of Septoria leaf spot on tomato leaf.

Viruses also can be very detrimental to tomato production. Symptoms were observed which indicated that the mosaic virus and the leaf curl virus may be serious problems in Paraguay. Figure 2 shows a tomato plant that may have leaf curl virus.

Fig. 2 Tomato plant with possible symptoms of leaf curl virus.

I was able to locate results of only one tomato fertilizer trial, and this trial was conducted at I.A.N. in 1980. the results of the trial are as follows:

Treatments:

N	P	K	Kg./Plot
0	0	0	29
10	4	6	42
20	8	12	43
30	12	18	30
40	16	24	21

The lowest fertilizer level gave the best economic response to fertilizer. The experiment was repeated in 1981 using the same treatments; yield results will be available in September of this year. Experiments of this type do not provide information as to which elements give the greatest response to each yield component.

I designed a complete factorial design with two levels of N, P and K, which can be conducted next year, in order to determine which elements contribute the greatest to yield increases. A soil analysis will be made before the experiment is established in the field so that the levels of N, P and K can be changed if necessary.

I also have included Mg and five minor elements because I have noticed symptoms on some plants that might indicate a deficiency of Mg, B and Zn. The experimental design is presented in Annex 2.

I have been able to locate only one commercial source of minor elements in Asuncion, and this contains Fe, Zn, B, Mn and Mo, as well as N, P, and K. If the plants from the minor element treatments give a yield response, it will be necessary to conduct other experiments in the future to determine which minor elements are responsible for the increase in yield. I have suggested that fertilizer trials be conducted on the farmer's farm so that they will have immediate application to the correct environment.

I have not been able to locate research information on other experiments except for one variety trial that was sprayed, and another variety trial that was not sprayed. The trial that was sprayed gave a higher yield than the variety trial that was not sprayed. The experiment was not designed to indicate which chemicals increased the yield. It would be desirable in the future to establish different insecticide and fungicide experiments to determine which chemicals produce economic yield on specific varieties. The experimental design for a fungicide trial is presented in Annex 3.

B. Strawberries

Strawberry variety trials were conducted from 1974 to 1981. The highest yielding varieties for each year were as follows:

Year	Highest Yielding Variety	Highest Yielding Variety, Kg./Plot
1974	Carnanducaia	8.477
1975	Florida 90	7.291
1976	Pedro Juan Caballero	11.525
1977	Pedro Juan Caballero	6.408
1978	Florida 90	9.983
1979	Florida 90	9.978

Another strawberry variety trial was established in 1981 with the following varieties: Campinas 2712, Florida 90, Monte Alegre, Pedro Juan Caballero and Campinas. Yield data should be available in August or September of this year. This is the first year that Campinas 2712 has been in a yield trial, but is is being increased as the variety to be released next year to growers who are under the project. When I asked why this variety was selected, I was informed that it was a new hybrid from Campinas, Brazil, and had performed well in Brazil.

USAID requested strawberry varieties from California and Florida. One hundred plants each of Sequoia, Tioga, Fresna and Alisa were

received in good condition from California. One hundred plants each of Dover and Florida Belle were received in were received in very poor condition from Florida due to a delay in transit; therefore, more plants of these two varieties have been requested. The plants will be increased so that they can be included in a variety trial next year. I have designed a randomized block design for the variety trial which is included in Annex 4.

Fertilizer trials have not been conducted on strawberries in the past. I have designed a complete factorial design for N, P, and K, which should be conducted next year. The experiment also will include Mg and minor elements. A copy of the design is included in Annex 5.

As viruses reduce yield in strawberries, it is very important to use virus-free plants when establishing new plantings. It would be advantageous to request a MASI technician who has had a great deal of experience in testing virus-free strawberries, to work for one month in order to train local personnel concerning modern techniques for screening virus-free plants. The I.A.N. would be a good location to maintain virus-free varieties for release to growers.

The virologist also could work on tomatoes since viruses may be a serious limiting factor in tomato production. The viruses must be identified and recommendations made for their control.

Experiments concerning control of leaf spot will be needed also; and experimental design is presented in Annex 6.

C. Bananas

There is a dearth of valid research data on bananas. It is very difficult to make reliable recommendations for cultural practices without valid research data.

The cost of controlling sigatoka is very expensive on one hectare plots since aerial applications of fungicides cannot be used. Low volume ground sprayers are very costly. If research results indicate that sigatoka control is economical, it might be desirable to have the local cooperatives provide low volume ground sprayers with an operator to the growers on a rental basis, thus it would not be necessary for each grower to own his own sprayer.

A banana variety trial was started last year, including Congo, Lacatan, Monte Cristo, Guana, Nanicao and Carapé, but no harvest data are available to date.

Since there have not been any fertilizer trials conducted on bananas, I designed a complete factorial design for two levels of N, P and K, to be conducted next year. This also will include Mg and minor elements. The plot design is included in annex 7.

Information is needed on pruning and sigatoka control since no experimental data are available at the present time in Paraguay. I designed a pruning experiment for bananas and another experiment for sigatoka control, since most of the farmers are not spraying for sigatoka at the present time. The experimental designs are included in Annexes 8 and 9, respectively. The latter experiment will provide information on whether it is economical to spray for the control of sigatoka on one-hectare plots.

D. Pineapple

Variety trials have not been conducted to determine which varieties give the highest yields. Smooth Cayenne, Red Spanish and Abachi are grown in Paraguay at the present time. Smooth Cayenne has been recommended as the variety to grow since CREDICOOP indicated this variety will gain the highest price in Buenos Aires.

It would be beneficial in the future to have a variety trial on pineapple to study the yield and quality potential of each variety. Since no fertilizer trials have been conducted on pineapples to date, these should be started as soon as possible. I designed a fertilizer trial for pineapples, and included it in Annex 10. A spacing trial also would be useful.

Some pineapple varieties do not produce suckers very well in Paraguay; therefore, research trials should be initiated in order to determine why some plants produce very few suckers. Research on

nematodes and plant nutrients might be considered in the research program. Leaf samples have been sent to North Carolina State University for an analysis of major and minor nutrients. The results of these analyses should indicate which elements are deficient in the soil; this could be one reason why the plants do not produce sufficient suckers for multiplying the plants.

There also is a possibility that early application of hormones in order to increase early fruit set may be responsible for the low sucker production. An experiment should be conducted, using different times of hormone sprays to determine whether they affect the low sucker production of the plants.

It will be necessary to produce or buy a sufficient number of suckers as planting material to plant fifty hectares of pineapples next year. It would be desirable to start a research project on pineapple tissue culture. The variety, Smooth Cayenne, which is recommended for the market, is not a variety that produces a large number of slips. Tissue culture research should be conducted on this variety so that the plant material can be produced in great quantities, since seven million plants will be needed to plant 150 hectares over the next two years.

It would be advantageous to request a plant physiologist for a period of one month, in order to assist in establishing a research program on plant tissue culture. If it is not possible to obtain a specialist who is fluent in Spanish, he could work closely with

Dr. Francisco Jordan, who could assist in training the local personnel.

III. PRODUCTION

The farmers participating in the project usually have less than six hectares, and are members of cooperatives. Seventeen hectares of tomatoes were planted in 1980, and eighteen hectares in 1981. Thirty-seven hectares of bananas were planted in 1980, and 13 hectares are scheduled to be planted in 1981. The plan calls for 100 hectares of bananas to be planted in 1982. The project recommends planting 25 hectares of strawberries in 1982, and 50 hectares in 1983, as well as 50 hectares of pineapple in 1982, and 100 hectares in 1984. The plan indicates also that 50 hectares of tomatoes should be planted in 1982.

Banana corms are being increased at the present time and Ing. Lopez suggested that 80 percent of the bananas should be Giant Cavendish, and 20 percent Oro. Smooth Cayenne has been recommended as the best pineapple variety, but it has the disadvantage of not producing many suckers for fast multiplication. The main advantage of this variety is that it is easy to harvest since it does not have many spines on the leaves, also that the market price is good in Buenos Aires at the present time.

It probably would be beneficial to have an evaluation of the project within the next six months, because the targets established

are not very realistic due to the limited amount of research information on the perennial crops, such as bananas and pineapples.

All of the participating growers are small farmers with a limited area for production. This means that they must take out other crops in order to plant perennial crops which will be harvested over a period of time. The project calls for one-half hectare on each farm in tomatoes or strawberries, and one hectare for bananas or pineapples. Since the perennial crops will represent 1/6 or 1/5 of the total farm area for a period of time, the farmer needs to be assured that the new crops will give him more profit than the crop that he will take out of production. It should be noted that bananas and pineapples are subject to frost damage, and usually are not grown further south or north of the equator than 20° latitude, for commercial production. The following newspaper clipping from the ABC Color newspaper, Asuncion, June, 1981, indicated the problem of growing bananas commercially in areas subject to frost:

50 hectáreas de cultivos dañados por escarchas

CORONEL OVIEDO (Amado Soto, corresponsal) – Graves perjuicios causó a la agricultura las intensas escarchas registradas en los últimos días en esta jurisdicción. Considerables hectáreas de plantaciones hortícolas fueron totalmente aniquiladas por el fenómeno climático.

Esta mañana, ULTIMA HORA consultó al gerente de la Cooperativa de Ahorro y Crédito de Coronel Oviedo, señor Heriberto González, que confirmó la información. Señaló que los cultivos de pimiento y tomate en un total de 10 hectáreas en las colonias Tayao y Blas Garay fueron "cortados" de raíces por las heladas, cuya intensidad no se recuerda en los últimos 5 años y que causaron estragos en las zonas cultivadas de la región.

Nuestro entrevistado, agregó que en compañía de funcionarios del Ministerio de Agricultura y Ganadería recorrió los lugares afectados. En la oportunidad, dijo, se comprobó también, que más de 40 hectáreas de banana, ubicadas en la Colonia Genaro Romero, sufrieron inconvenientes a consecuencia de las escarchas. El señor González consignó que la entidad que preside otorgó más de 5 millones de guaraníes de crédito para estos cultivos y que con estos percances las pérdidas alcanzarían millonarias sumas. Añadió que prácticamente el 30% de la producción se ha perdido.

Debemos señalar, según nuestra fuente, que las bananas se encuentran literalmente "calcinadas", pero que los agricultores esperan su recuperación. Manifestaron, que si dentro de 8 días no se restablecen, procederán a cortar las plantaciones en busca de nuevos brotes.

Las heladas, igualmente, castigaron, pero en menor intensidad, vastas extensiones de caña dulce.

Los labriegos señalaron que de repetirse este fenómeno las pérdidas serían incalculables.

It might be beneficial to increase the areas of tomatoes and strawberries in the future, since there is more research information available on these crops, and to reduce the target hectares on the perennial crops until more research information is available.

The evaluation team should include specialists on bananas and pineapples.

A. Audio-Visual Aids

Mr. Ricardo C. Dawson Torres and Mr. Hector Wong Lu arrived in Asuncion, May 5, 1981, and departed July 2, 1981. They have trained several communication media specialists at CREDICOOP in the techniques of making videotapes on crop production. Some of their equipment arrived late, thus it was possible to make only one videotape on tomato production, which included pruning and tying tomatoes to stakes, as well as information concerning pest control. It will be necessary for them to return in the future in order to assist the local team in making more videotapes on tomatoes, as well as on other crops.

I made flip books on pineapples, bananas, strawberries, and taking soil samples, which will provide the information needed to produce the videotapes in the future. Copies of the flip books are presented in Annexes 13, 14, 15 and 16. The communication media team will take the pictures that are not included, and place them

in the book before it is reproduced. The pictures will be in black and white, except the pictures that show diseases or plant nutrient deficier in order to reduce the cost of the publications. Each farmer will receive a copy of the book to take home, when he sees the videotape at the cooperative.

It would be of great value also to set up an audiotutorial laboratory at each cooperative that participates in the program. this would consist of a small booth similar to a telephone booth, with a desk and shelf for a 35 mm. projector that has a synchronized cassette player. The slides will be in color, and the pictures will be the same as the ones in the flip book. A narration in Guarani will be on the cassette tape, synchronized with the picture, to inform the farmer of the proper cultural practices. This also will help to educate the extension staff in the field, providing them with more information. The equipment should be left at the cooperatives so that farmers and extension specialists can review them at any time.

B. Soil and Tissue Analysis

Soil samples were taken on the farms where some of the growers were going to plant tomatoes in 1980, and analyses were made at the Universidad Nacional de Asunción, in the Laboratorio de Suelos, Facultad de Ingeniería Agronomica. I reviewed all of the soil analyses that I could locate, and found that a complete fertilizer was recommended to all the farmers. Several of the analyses

indicated soils with over 100 ppm of K_2O; the critical level for K_2O is 46; therefore, farmers were recommended to apply an element that they did not need. If they continue to apply potassium (K) when it is not needed, there is a tendency to establish an antagonistic effect between magnesium and potassium, which causes a magnesium deficiency and reduces yield. This results in a farmer not only paying for fertilizer that he does not need, but also may result in reducing the yield of his crop eventually. The soil analyses on some farms were well above the critical level of 12 ppm for P_2O_5, but a complete fertilizer was recommended for all farmers.

The results of fertilizer experiments should be correlated with soil and tissue analyses, so that accurate fertilizer recommendations can be made in the future.

Soil samples were taken from farms where tomatoes were grown in 1981, but to date they have not been analyzed. If the soil samples are not analyzed, they are of no value to the farmer. When I asked why they were not analyzed, I was informed that they are short of reagents. I tried to find out what reagents are needed, but to date, I have not been able to find out what reagents are not available locally.

I visited the laboratory at the I.A.N., which has a great deal of expensive laboratory equipment provided by USAID in recent years. The laboratory appeared as if it had not been used recently. The

atomic absorption spectophotometer had been sent out for repairs because it had been damaged due to a surge of electricity when it was being used.

Twenty-five soil samples were taken on the farms where bananas were planted in 1980, and were analyzed by the soils laboratory at the Facultad de Agronomía. A complete fertilizer of 15-15-15 was recommended to be used on the bananas. Ten of the samples had more than 100 ppm of K_2O in the soil; since the critical level is only 46 ppm, the soil already had more K_2O than the bananas probably would need.

I made recommendations for all the soil analyses on bananas and tomatoes that I was able to locate, which are presented in Annexes 11 and 12, respectively. I indicated that K_2O and P_2O_5 should not be applied if the soil analysis indicates the levels to be well above the critical level. The cooperative sent soil samples from the farms producing bananas to Brazil for analysis in 1981. It would be advantageous to have a soil scientist come to Paraguay as soon as possible under the MASI contract, in order to assist the laboratory personnel in making soil analyses and recommendations in a timely fashion so that they will benefit the farmers.

I was informed that the Nitroquimics Paraguaya S.A. can mix fertilizers in any ratio that is needed; therefore, it is important to conduct fertilizer trials as soon as possible in order to

determine what ratio or what nutrients are needed for the different environments under which the crops are grown.

IV. LOGISTICAL SUPPORT

The Project Implementation Order for technical services between USAID and CREDICOOP indicates that CREDICOOP will provide office space, office equipment, transportation and secretarial services. The facilities that CREDICOOP has at the present time are extremely limited, and it would be difficult for them to provide desks and office space for more than two persons at a time, until CREDICOOP moves into its new building. CREDICOOP does not have a need for bilingual secretaries, therefore, it is difficult to provide a first class service for typing documents in English; the secretaries do an excellent job of typing in Spanish, however. CREDICOOP can supply office equipment such as calculators and Spanish typewriters, also facilities for copying documents.

Lack of transportation has been a very serious problem at times, due to the limited number of vehicles that CREDICOOP has for its staff. Lic. Juan Peralta, the General Manager of CREDICOOP, has made a determined effort to provide transportation to MASI personnel, but it has been very difficult at times, and has necessitated taking qualified technicians away from their own activities since CREDICOOP does not hire chauffeurs. The MASI technicians have had to take taxis and do a lot of walking between offices, which takes valuable time away from the job for which they

were hired. On one field trip, the gear of a vehicle got stuck in first gear, and it was necessary to push the vehicle to go backwards, and then we had to return 25 kilometers to Asuncion in first gear. I found out later that USAID had provided the vehicle to CREDICOOP four years ago under a Grant-in-AID. When USAID surveys a vehicle, it usually is not economical to run it any longer.

I would like to suggest that the MASI/USAID contract be amended to delete the line item for a weed control specialist, and to purchase or rent a vehicle for MASI personnel, so that they can be more effective in their work. The MASI personnel should spend at least four days of every week in the field with the farmers, extension and research personnel if the objectives of the project are going to be implemented.

I believe that a weed control specialist will not be needed for the project. The size of the plots is small (½ to 1 hectare), and can be weeded by members of the family. Most of the farmers interviewed have six to ten members in the family. I was informed that rains usually do not prevent people from getting into the fields for long periods of time. When labor is sufficient, herbicides are not necessary unless heavy rains over a period of time prevent people from entering the field. All of the farms that I visited were free of weeds, which indicated to me that the growers are doing a good job in weed control. Another factor to be considered is that at the present time, herbicides would have little or no

economic value for the small growers, in which case they would not be encouraged to use them.

When an evaluation is made for the project, a review of the logistical support should be studies, as well as the technical aspects of the project.

I believe that CREDICOOP can supply all of the logistical support after the move into the new office building, but I do feel that some improvement needs to be made in the area of transportation, in order to be sure that MASI technicians can make their greatest possible contribution to the project.

V. PERSONNEL

There is not sufficient personnel at the present time to implement the project in a satisfactory manner. At least four well qualified extension specialists will be needed to work closely with Dr. Francisco Jordan, in order to implement the extension trials suggested in Annexes 1 through 10. It would be advantageous to try to obtain the services of Mr. Edward Zappe, who is a Peace Corp volunteer at the IAN, and has a degree in soil science. He could make an excellent contribution in assisting in establishing and implementing the fertilizer trials.

Another production specialist will be needed to work with the farmers in the future, since the area under production will be

expanded considerably during the next two years. It would be beneficial to have one production specialist to work on the annual crops, and another specialist to work on the perennial crops. The production specialists should spend about four days a week in the field with the farmers. They should have meetings with the extension specialists every week, in order to discuss pest and cultural problems.

VI. SUMMARY

It would be advantageous to have a technical and management evaluation within the next six months for the project. Two weeks should be sufficient for this evaluation. The team should include a person with experience in the cultural practices of banana production. Specialists in pineapple, tomato and strawberry production also should be included. One team member should be an agricultural economist with a great deal of experience in marketing. all of the team members should have a working knowledge of Spanish.

The evaluation team should review the technical and management aspects of the project, and submit a report in both English and Spanish.. The report should include an economic analysis of the crops that have been produced and sold during the past two years. Recommendations should be made on any changes that appear necessary, in order to improve the efficiency of the project, so as to achieve the purpose and goals of the project.

In final summary, I am listing a few recommendations and suggesting action agents:

	Recommendations	Action Agents
1.	Request a technical and management evaluation within the next six months.	USAID and CREDICOOP
2.	Amend the PIO/T so that the contractor will be responsible for providing local transportation for its staff.	USAID and CREDICOOP
3.	Amend the MASI/USAID contract to delete funds for a weed specialist and use the funds for local transportation for MASI personnel.	USAID and MASI
4.	Amend line item 6 under Table III in the Project Paper for project expenditures to read "Seed Improvement, Multiplication and Extension Trials".	USAID and CREDICOOP
5.	All soils and tissue analyses should be made promptly, and results returned to farmer within 2 weeks, for his benefit.	CREDICOOP and Soils Lab. at Fac. of Agronomia
6.	All randomized block design experiments should have border rows in the future.	MAG
7.	The plot size for all experiments should include walkways and the data presented in reports should be converted to yield per hectare.	MAG
8.	A soils specialist is needed as soon as possible to assist in the laboratory, as well as for establishing fertilizer trials.	MASI
9.	It might be beneficial to limit the expansion of banana plots until after an evaluation.	USAID and CREDICOOP
10.	USAID should encourage the Government of Paraguay to reduce or remove tariffs on agricultural inputs. This would tend to increase production.	USAID and Government of Paraguay

ANEXO

ENSAYO DE VARIEDADES DE TOMATES

N°	PAISES	VARIEDADES	EN U.S.A. N° DE LAS VARIEDADES
1	Netherlands	Oktjabrenok	250.124
2	Czechoslovakia	Pruhonichy	250.435
3	Italia	Barese O "A Pruno	255.829
4	Bolivia		260.399
5	Alemania	Weihenstephan Freising	262.173
6	Netherlands	Pride Selection C	263.000
7	Puerto Rico		263.713
8	URSS	Pioneer 2761	298.633
9	USA - Rhode Island		341.984
10	" " "		341.985
11	" " "		341.986
12	" " "		341.987
13	" " "		341.988
14	" " "		341.989
15	Japón	NoZomi	
16	Brasil	Santa Cruz	

DISPOSICION DE LAS PARCELAS POR ENSAYO DE VARIEDADES - BLOQUES AL AZAR

BORDE

3 2 1 12 4 14 13 9 5 16 8 11 6 10 7 15

BORDE

REPETICION -I

HILERAS

16 9 13 8 5 2 4 15 12 6 3 7 14 11 10 1

HILERAS

REPETICION II

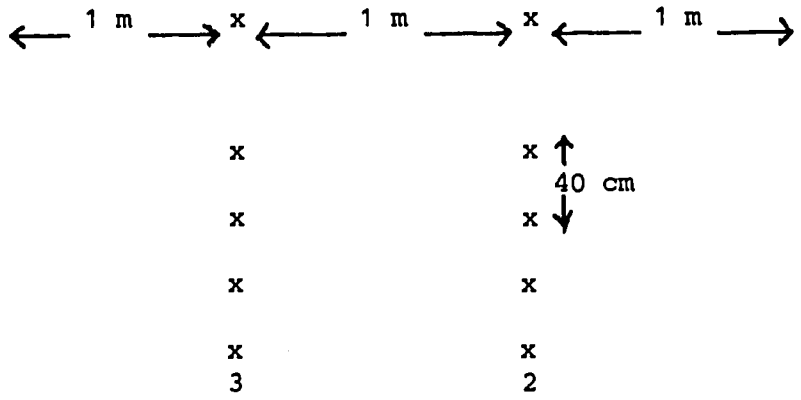
7 14 6 4 15 1 8 2 12 13 5 11 10 3 9 16

REPETICION III

6 1 2 9 8 3 10 5 11 7 4 12 14 15 16 13

REPETICION IV

MUESTRAS DE PARCELAS



TAMAÑO DE PARCELA

1 m x 2 m = 2 m^2

Aplicar todo el Superfosfato triple (10,6 grs.por planta) cuando se trans planten las plantas, en bandas laterales a 10 cm de las mismas y a 10 cm de profundidad.

Aplicar 6,7 grs de urea y 3,6 grs de KCl cuando se transplante, tanto la la urea como el potasio se ponen a 7,5 cm lateralmente a las plántas y a una profundidad de 7,5 cm. Despúes de 3 a 6 semanas del transplante se aplican 3,3 grs. de urea y 1,8 grs. de KCl por planta cada vez.

En el almácigo solo debe emplearse abono orgánico.

ANEXO 2

TABLA I - ENSAYO FACTORIAL COMPLETO DE N, P, K, Mg Y ELEMENTOS MENORES PARA TOMATE EN 1982

LA GRANJA DE JUAN MANCUELLO EN QUINDY -- BLOQUES AL AZAR -- VARIEDAD NOZOMI

Nº	TRATAMIENTO KG/HA					GRAMOS POR PLANTA AL MOMENTO DEL TRANSPLANTE					GRAMOS POR PLANTA DESPUES DE LAS SGTES. SEMANAS DEL TRANSPLANTE			
	N	P_2O_5	K_2O	MgO	1/ E.M.	UREA 46%N	3/ P.S.T. 46%P_2O_5	CL K 60% K_2O	OMG 12%	2/ N,P,K + EM	UREA 3	UREA 6	CL K 3	CL K 6
1	0	0	0			0	0	0	0	0				
2	0	0	340			0	0	16,3					1,2	1,2
3	0	272	0			0	21,3	0						
4	0	272	340			0	21,3	16,3					1,2	1,2
5	170	0	0			10,6					1,3	1,3		
6	170	0	340			10,6		16,3			1,3	1,3	1,2	1,2
7	170	272	0			10,6	21,3				1,3	1,3		
8	170	272	340			10,6	21,3	16,3			1,3	1,3	1,2	1,2
9	170	272	340	85		10,6	21,3	16,3	25,5		1,3	1,3	1,2	1,2
10	170	272	340	85	B,Fe,Mn Mo, Zn		10,6	9,2	25,5	61,2				

1/

EM	KG/HA
B_2O_3	1,02
F_2O_3	9,69
MnO_3	1,02
MoO_3	0,17
ZnO	2,04

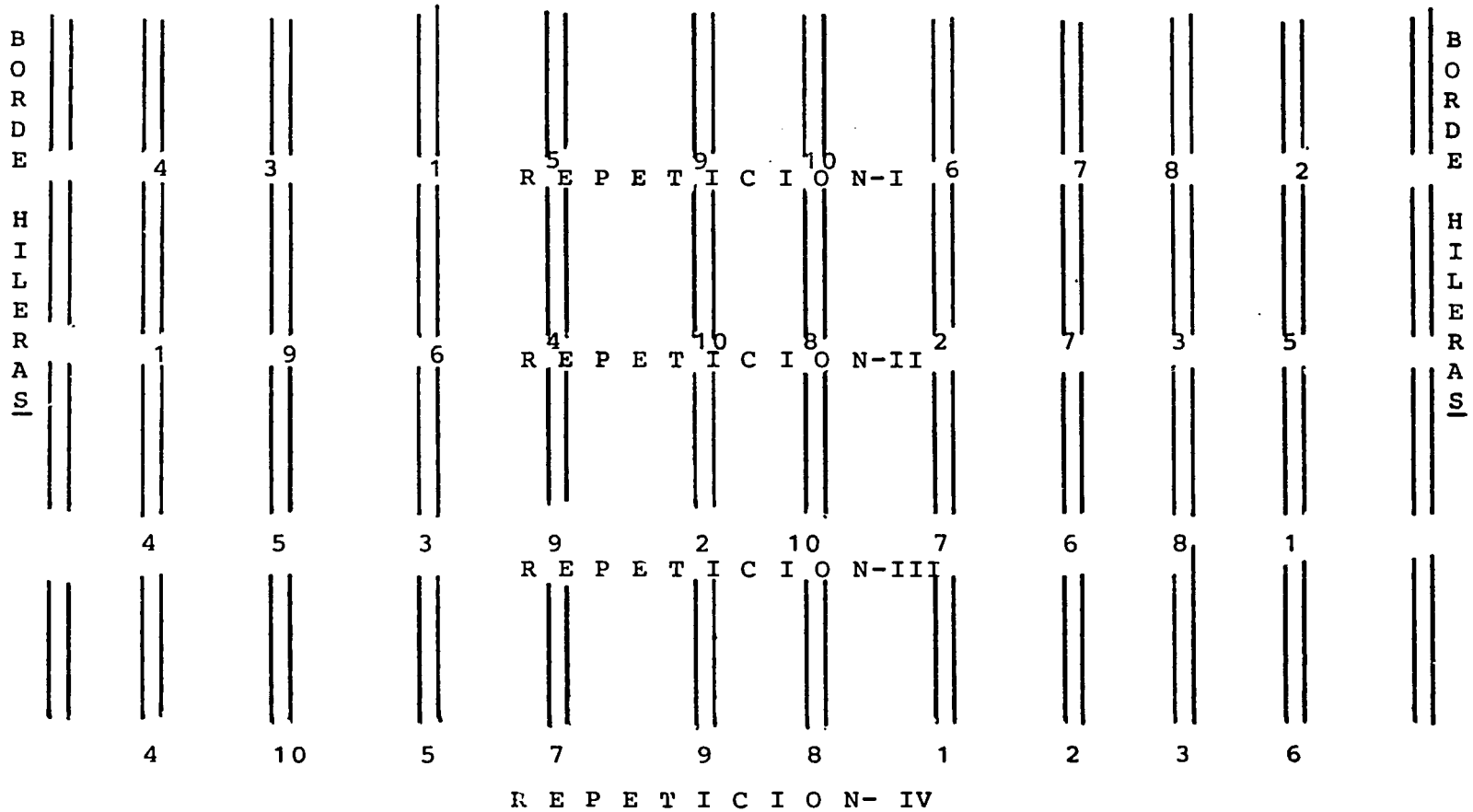
2/ Ortho Evergreen usado: contiene ---

Elemento	Porcentaje
N	10,00
P	8,00
K	7,00
B_2O_3	0,06
Fe_2O_3	0,57
MnO_3	0,06
MoO_3	0,01
ZnO	0,12

3/ Aplicar todo el superfosfato triple cuando se transplanten las plantas en bandas laterales a 10 cms de la planta y a 10 cms de profundidad. Aplicar la cantidad que se indica de la urea y cloruro de potasio cuando se transplante, tanto la urea como el potasio se pone a 7,5 cms lateral de las plantas y a una profundidad de 7,5. Despúes de 3 o 6 semanas del transplante se aplica la cantidad de fertilizantes que se indica en la Tabla 1.

3.

DISPOSICION DE LAS PARCELAS POR CADA ENSAYO FACTORIAL COMPLETO DE N,P,K y Mg Y ELEMENTOS MENORES PARA TOMATES EN 1982 - BLOQUES AL AZAR



** *** **** *** **

Distancias en la parcela:

80 cms entre hileras

1 metro entre doble hileras

40 cms entre plantas en los surcos

10 plantas por hileras dobles, con surcos de 5 plantas cada una

3,6 m^2 por parcela

<u>Observación</u> : En el almácigo solo debe emplearse abono organico; no así abono químico.

Las frutas deberian ser clasificados, pesados y registrados para cada parcela, y las frutas contadas, para determinar el tamaño promedio de las frutas.

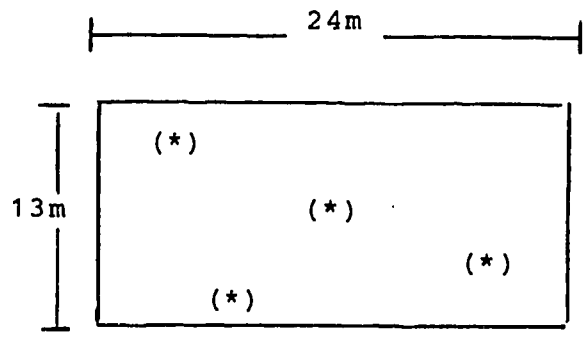
M U E S T R A S D E P A R C E L A S

```
X        X        X        X
X        X        X        X
X        X        X        X
X        X        X        X
                           ↑
                          40cm
X←80cm→X←  1  m  →X←80cm→X
```

TAMAÑO DE PARCELA

1.80 cm x 2.00 = 3.60 m^2

Espacio Total = 24m x 13m



(*) Muestras de suelo.-

ANEXO 3

ENSAYO DE LOS FUNGICIDAS PARA TOMATE

VARIEDAD - NOZOMI

No.	TRATAMIENTO	DOSIS
1	Testigo (sin tratamiento)	
2	Cupravit	15 gramos/5 litros
3	Dithane M-45	12,5 gramos/5 litros
4	Tricarbamix 5	12,5 gramos/5 litros
5	Pulverizar alternando semanalmente con Cupravit y Dithane M-45	15 gramos/5 litros de Cupravit y 12,5 gramos/5 litros de Dithane M-45

MUESTRAS DE PARCELAS

x x x x

x x x x

x x x x

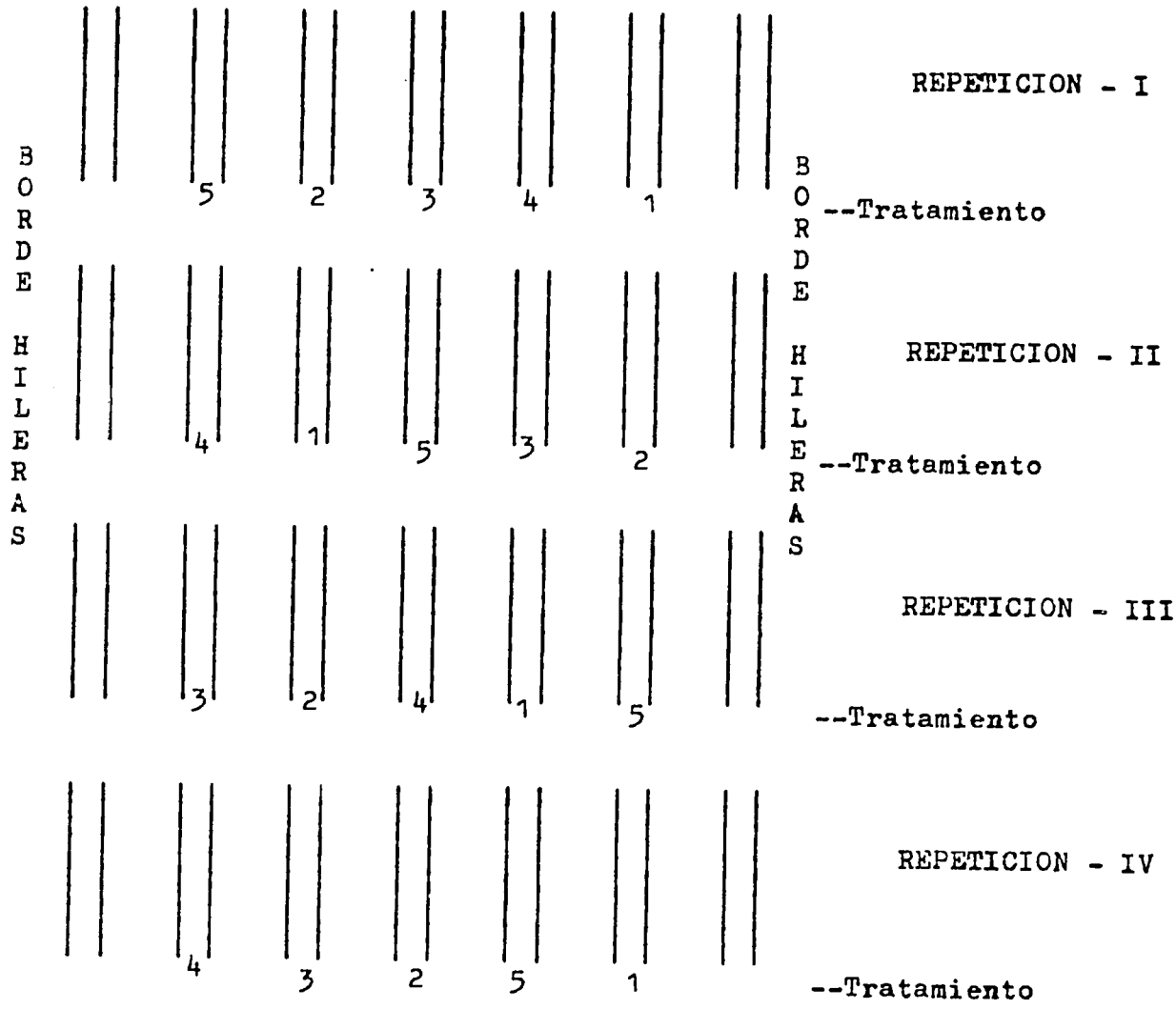
x x x x

40↑m

x-- 80m---x---100m---x--80m---x

3,6 m^2 por parcela

DISPOSICION DE LAS PARCELAS/FUNGICIDAS PARA TOMATE



* * *

Fertilizar con 10,6 g/planta de Urea, 21,3 g/planta de TSP y 16,3 g/planta de cloruro de potasio al transplantar, y aplicar 1,3 g/planta de Urea y 1,2 g de KCl 3 y 6 semanas despues del transplante.

Las frutas deberan ser clasificados, pesados y registrados para cada parcela, y las frutas contadas para determinar el tamaño promedio de la fruta.

ANEXO 4

ENSAYO DE VARIEDADES DE FRUTILLA PARA 1982

Nº	VARIEDADES	PAISES
1	Sequoia	California, U. S. A.
2	Tioga	California, U. S. A.
3	Fresna	California, U. S. A.
4	Alisa	California, U. S. A.
5	Dover	Florida, U. S. A.
6	Florida Belle	Florida, U. S. A.
7	Florida 90	Florida, U. S. A.
8	Campinas 2712	Brasil
9	Campinas	Brasil
10	Monte Alegra	Paraguay
11	Pedro J. Caballero	Paraguay

Las frutas deberan ser clasificados, pesados, y registrados para cada parcela, y las frutas contadas para determinar el tamaño promedio de las frutas.

DISPOSICION DE LAS PARCELAS POR ENSAYO DE VARIEDADES DE FRUTILLA EN 1982

BLOQUES AL AZAR

BORDE HILERAS

3 2 1 4 9 5 8 11 6 7 10

REPETICION I

---Tratamientos

6 3 7 11 1 10 9 8 5 2 4

REPETICION II

---Tratamientos

7 6 4 1 8 2 5 11 10 3 9

REPETICION III

-----Tratamientos

8 4 1 11 2 3 7 6 10 9 5

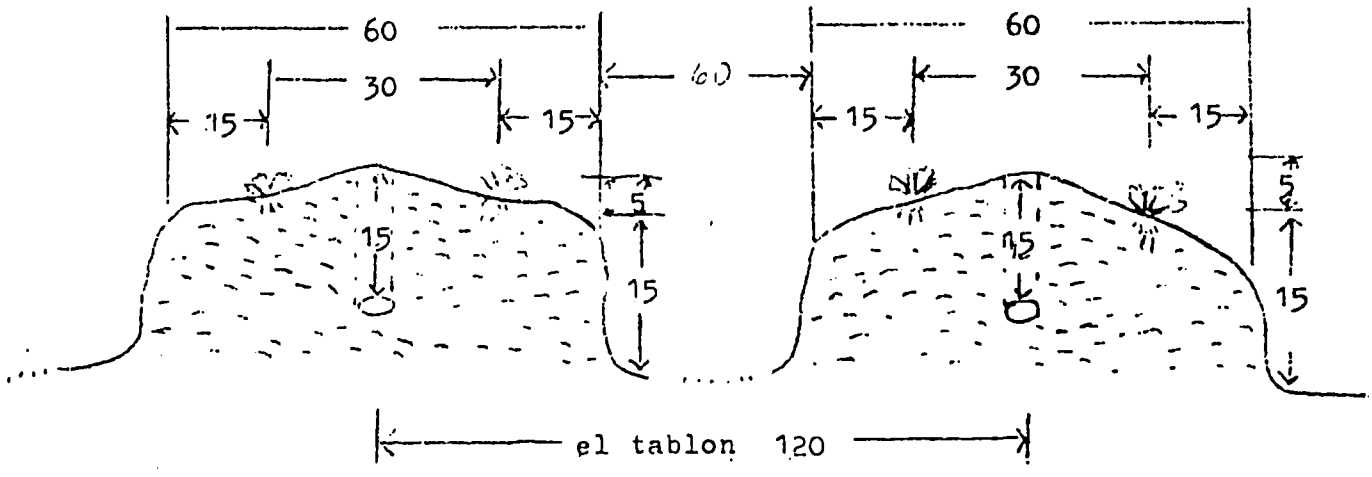
REPETICION IV

-----Tratamientos

FERTILIZANTES EN BANDAS:

Aplicar 28,8 g de urea, 38,5 g de superfosfato triple y 29,7 g de cloruro de potasio en bandas en el centro del tablon a 15 cm de profundidad por cada 10 plantas.

MUESTRA DE LOS TABLONES



Plastico o paja y hojas

Fertilizantes al voleo

Fertilizantes a banda

TABLE 3. ENSAYO FACTORIAL COMPLETO DE N, P, K, MG, Y ELEMENTOS MENORES PARA FRUTILLA EN 1982 = VARIEDAD CAMPINAS 2712 -----BLOQUES AL AZAR

NO	TRATAMIENTO Kg/Ha					GRAMOS POR PARCELA ANTES DEL TRANSPLANTE 3/					GRAMOS POR PARCELA EN TABÑONES 4/			
	N	P_2O_5	K_2O	MgO	EM 1/	Urea 46%N	SPT 46% P_2O_5	ClK 60% K_2O	OMG 12%	2/ NPK +EM	Urea	SPT 46%	ClK 60% K_2O	NPK +EM
1						0	0	0	0	0	0	0	0	0
2			99			0	0	14.9	0	0	0	0	14.9	0
3		99				0	19.4	0	0	0	0	19.4	0	0
4		99	99			0	19.4	14.9	0	0	0	19.4	14.9	0
5	74					14.5	0	0	0	0	14.5	0	0	0
6	74		99			14.5	0	14.9	0	0	14.5	0	14.9	0
7	74	99				14.5	19.4	0	0	0	14.5	19.4	0	0
8	74	99	99			14.5	19.4	14.9	0	0	14.5	19.4	14.9	0
9	74	99	99	85		14.5	19.4	14.9	11.6	0	14.5	19.4	14.9	0
10	74	99	99	85	B, Fe, Mn, Mo, Zn	0	7.8	3.8	0	66.6	0	7.8	3.8	66.6

1/

E. M.	Kg/Ha
B_2O_3	1,02
FeO_3	9,69
MnO_3	1,02
MoO_3	0,17
ZnO	2,04

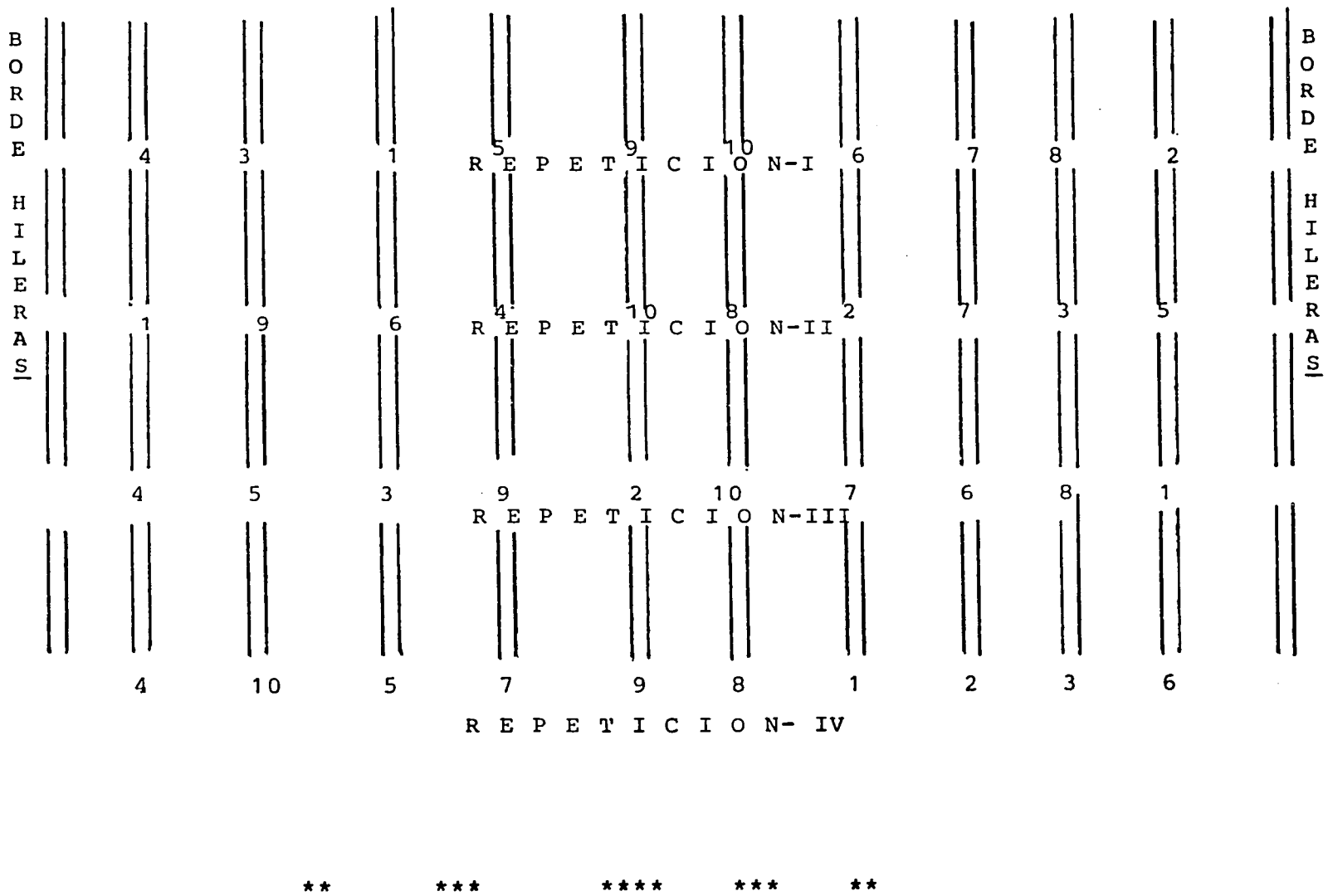
2/ Ortho Evergreen usado contiene:

Elemento	Porcentaje
N	10.00
P	8.00
K	7.00
B_2O_3	0.06
FeO_3	0.57
MnO_3	0.06
MoO_3	0.01
ZnO	0.12

3/ Aplicar el fertilizante indicado por todas partes (al voleo), y rastrear el suelo antes de que los tablones esten hecho. Usar la cantidad como se indica para cada parcela.

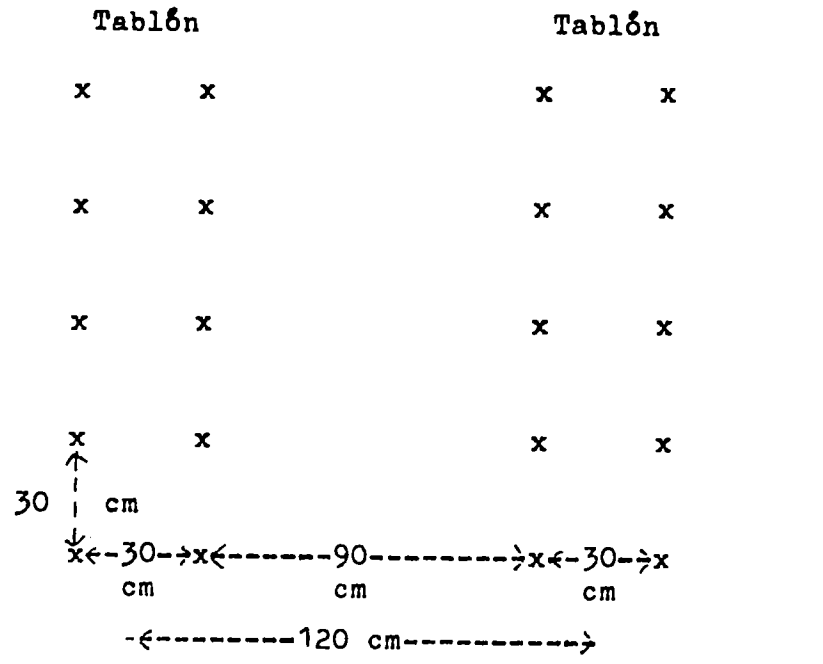
4/ Aplicar el fertilizante indicado en una banda al centro del tablon, a 15 cmts de profundidad, para la época del transplante.

TABLA 4. ENSAYO FACTORIAL COMPLETO DE N, P, K, Mg Y LOS ELEMENTOS MENORES PARA FRUTILLA EN 1982 - DISPOSICION DE LAS PARCELAS

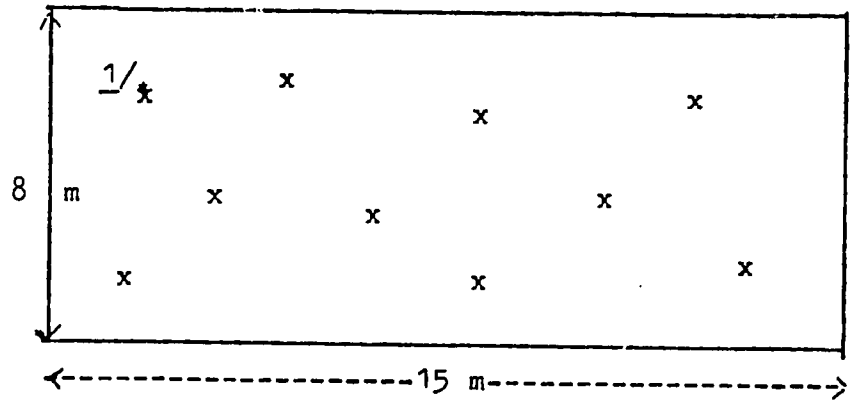


** *** **** *** **

MUESTRAS DE PARCELAS



1,20 x 1,50 cm = 1,8 m^2



Area total
= 8 m x 15 m

1/ Muestras de suelo antes aplicacion del fertilizante

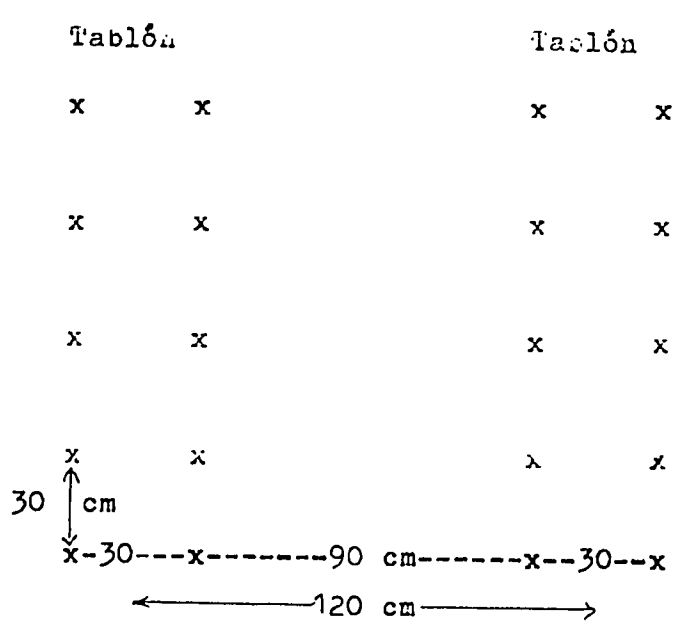
ANEXO 6

ENSAYO DE FUNGICIDAS PARA LAS FRUTILLAS

Nº	TRATAMIENTO	DOSIS
1	Sin tratamiento (testigo)	
2	Topsin M	30 grs. en 20 litros
3	Ziram (Tricarbomix 5)	50 grs. en 20 litros
4	Maneb (Dithane M-22)	50 grs. en 20 litros

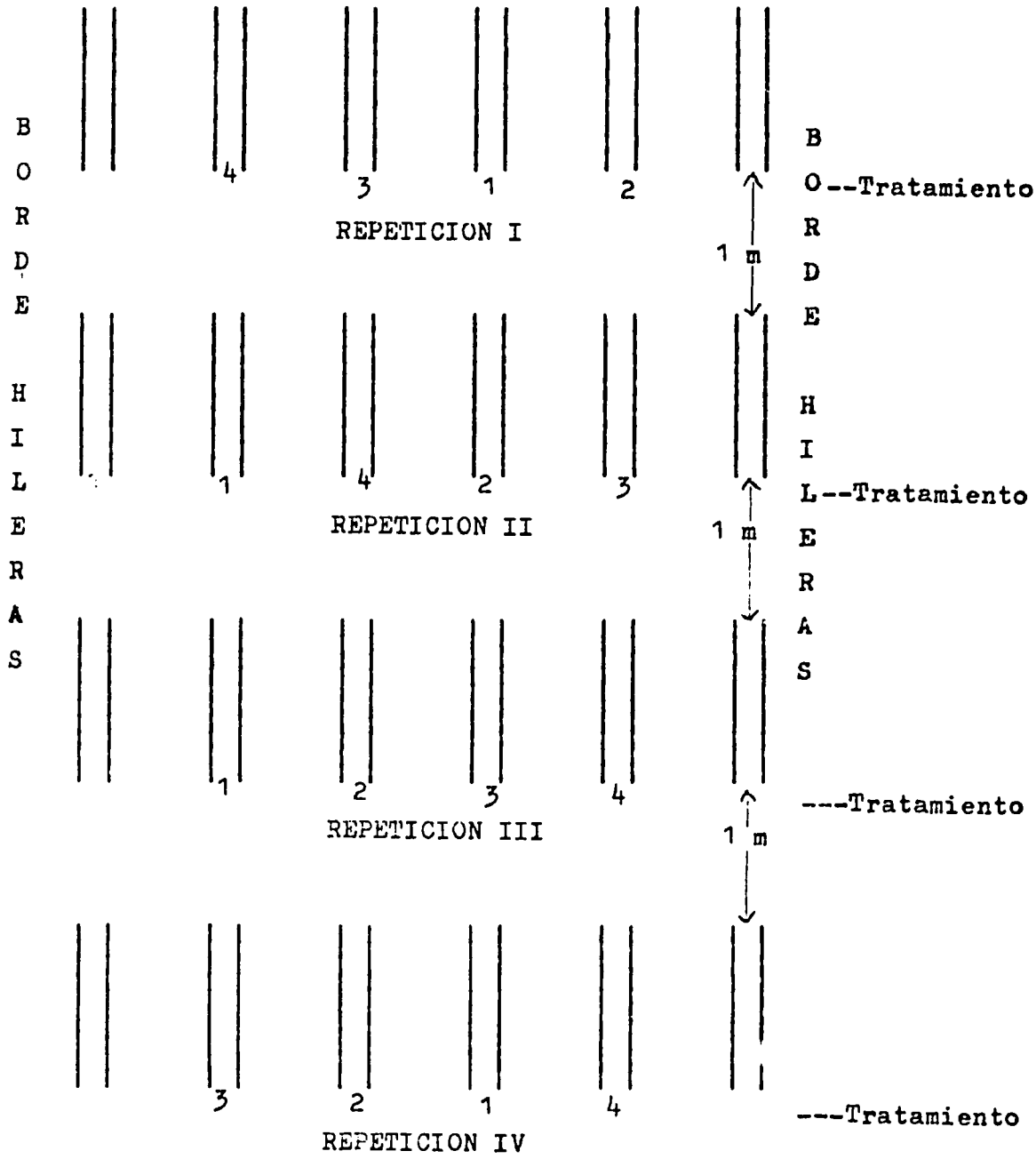
Empieza el programa de pulverización cuando el 5% de las plantas tienen la enfermidad "Mancha de la Hoja".

MUESTRAS DE PARCELAS



1.20 x 1.50 = 1.8 m^2 por parcela

DISPOSICION DE LAS PARCELAS/FUNGICIDAS PARA FRUTILLAS



Aplique 1,15 kg de urea, 1,54 kg de superfosfato triple y 1,19 kg de cloruro de potasio al voleo para el total del área (72 m^2) de ensayo, rastrear el suelo antes de plantar. Después construir los tablones y aplicar la misma cantidad en una bande en el centro del tablon, a 15 cm de profundidad.

Las frutas deberan ser clasificadas, pesadas y registradas para cada parcela, y las frutas contadas para determinar el tamaño promedio de la fruta.

ANEXO 7

TABLA 2 - ENSAYO FACTORIAL COMPLETO N, P, K, Mg Y ELEMENTOS MENORES PARA BANANA EN 1982 - BLOQUES AL AZAR - VARIEDAD LACATAN

N°	TRATAMIENTO Kg/Ha					GRAMOS POR PLANTA EN SETIEMBRE Y ENERO				
	N	P_2O_5	K_2O	MgO	E.M.1/	UREA 46%	P.S.T.3/ 46% P_2O_5	CLK 60% K_2O	MgO 12%	N, P, K,2/ + EM
1	0	0	0			0	0	0	0	0
2	0	0	240			0	0	180	0	0
3	0	56	0			0	55	0	0	0
4	0	56	240			0	55	180	0	0
5	80	0	0			78	0	0	0	0
6	80	0	240			78	0	180	0	0
7	80	56	0			78	55	0	0	0
8	80	56	240			78	55	180	0	0
9	80	56	240	100		78	55	180	375	0
10	80	56	240	100	B,Fe,Mn MO,Zn			138	375	360

..//

1/

EM	KG/Ha
B_2O_3	.48
Fe_2O_3	4.56
MnO_3	.48
MoO_3	.08
ZnO	.96

2/ Ortho Evergreen usado contiene:

ELEMENTO	PORCENTAJE
N	10,00
P	8,00
K	7,00
B_2O_3	0,06
Fe_2O_3	0,57
MnO_3	0,01
ZNO	0,12

DISPOSICION DE LAS PARCELAS POR CADA ENSAYO FACTORIAL COMPLETO DE N,P,K y Mg

Y ELEMENTOS MENORES PARA BANANA EN 1982 - BLOQUES AL AZAR

BORDE

4 3 1 5 9 10 6 7 8 2

R E P E T I C I O N N-I

HILERAS

1 9 6 4 10 8 2 7 3 5

R E P E T I C I O N N-II

4 5 3 9 2 10 7 6 8 1

R E P E T I C I O N N-III

4 10 5 7 9 8 1 2 3 6

R E P E T I C I O N N-IV

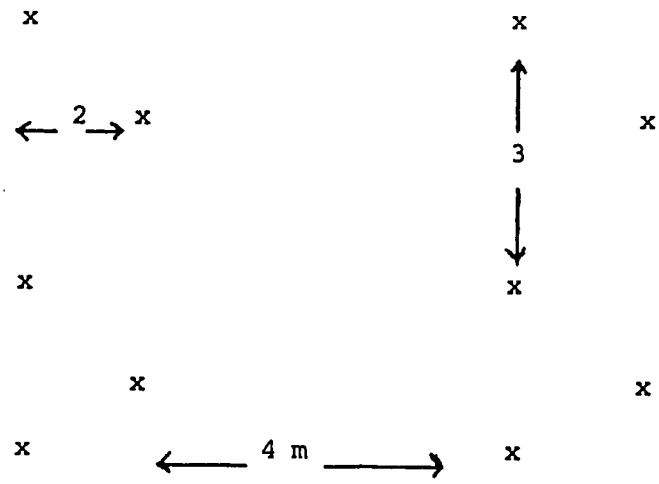
BORDE

HILERAS

***** ********* *****

3/ Aplicar el Fosfato Triple y Ortho Evergreen dentro de los hoyos, a 15 cm de profundidad debajo de la linea de goteo de las hojas. Aplicar los demás fertilizantes por todas partes (al voleo) debajo del aŕea de goteo de las hojas, y remover la tierra. El fertilizante debe aplicarse en enero y setiembre cada año.

MUESTRAS DE PARCELAS



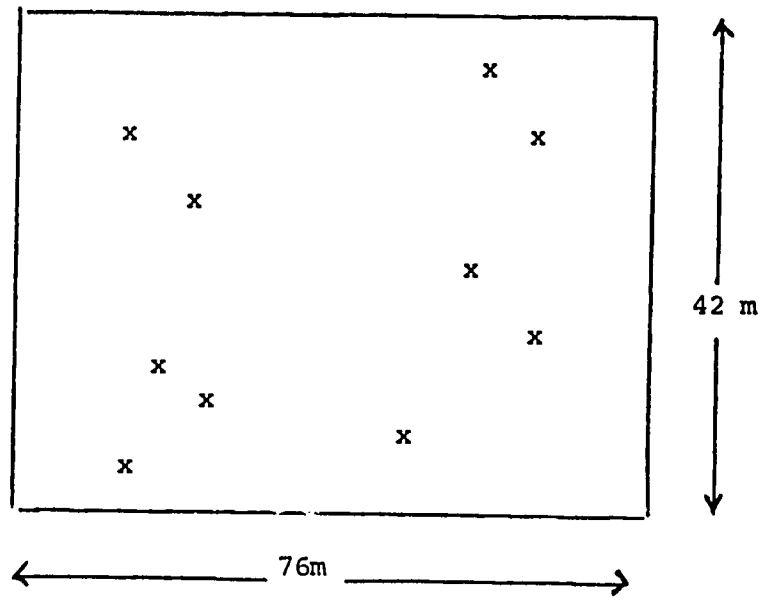
Distancias en la parcela

2 metro entre hileras
4 metros entre doble hileras
3 metros entre plantas en los surcos
5 plantas por hileras dobles
9 m^2 por parcela

Las bananas deberán ser clasificadas como comercializables o no, y pesadas separadamente; los cachos deben ser pesados y las frutas contadas. Las manos deberán ser pesadas otra vez.

Tomar tres muestras del suelo por parcela cada seis meses, y del suelo al azar del área antes de aplicar el abono.
Tomar muestras de tejido de la parte media de la tercera hoja de la planta con fruta de cada parcela para análisis. De cada cinco plantas, una deberá ser tomada y mesclada como muestra para un análisis, tambien cada seis meses.

..//


42 m
76m

ANEXO 8

ENSAYO PARA LA PODA DEL BANANO

No.	TRATIMIENTO
1	Poda hasta 3 chupones por mata
2	Poda hasta 6 chupones por mata

En el ensayo No. 1 podaran para que haya un tallo produciendo, y un tallo que es hijo como un seguidor, y un tallo que es un nieto como un segundo seguidor. Todos los otros chupones se quitaran cada dos meses.

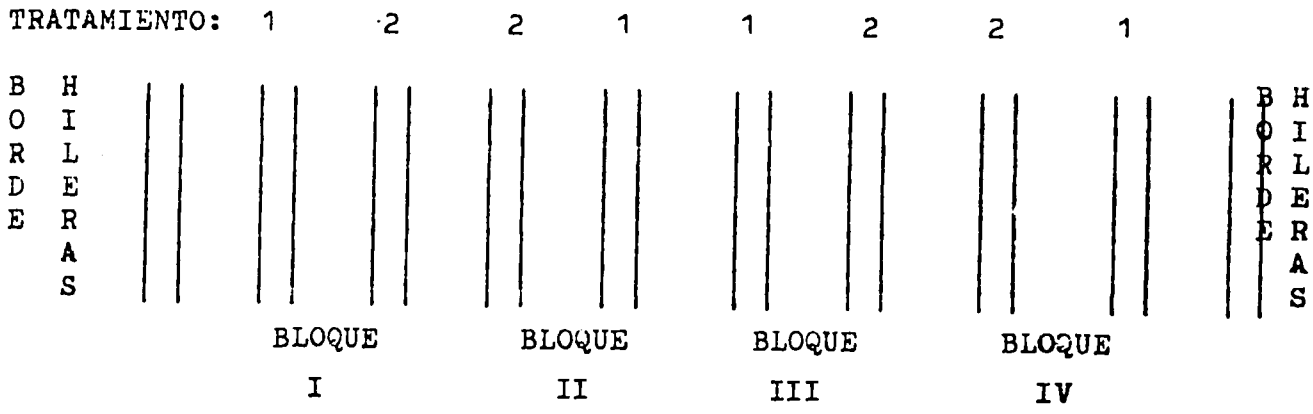
El ensayo No. 2 sera un sistema que esta usado ahora en Paraguay por algunos de los agricultores de banano. Dos tallos produciran al mismo tiempo, con dos tallos de hijo como seguidores, y dos tallos de nieto como segundos seguidores. Todos los otros chupones se quitaran cada dos meses.

Los datos de cosecha se tomaran por parcela incluyendo el peso del cacho, y el numero de las frutas. Todas las manos se quitaran y pesaran.

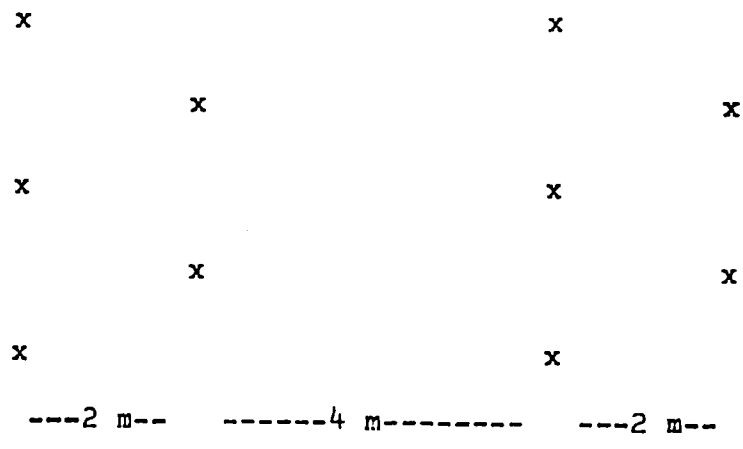
La fruta se clasificara tanbien como comerciable o no comerciable, y se pesara por clase.

Aplique 100 gramos de urea, 100 gramos de superfosfato triple and 100 gramos de cloruro de potasio por planta cada seis meses.

DISPOSICION DE LAS PARCELAS - BLOQUES AL AZAR



MUESTRAS DE PARCELAS



Distancias en la parcela:

2 m entre hileras

4 m entre doble hileras

($54\ m^2$ por parcela)

3 m entre plantas en los surcos

5 plantas por hileras doble

ANEXO 9

ENSAYO DE FUNGICIDAS PARA CONTROLAR LA SIGATOKA EN EL BANANO - VARIEDAD LACATAN

No.	TRATAMIENTO
1	Testigo
2	18 litros de aceite para aspersiones agricolas por hectarea, es suficiente para 0.4 litro por 4 replicaciones.
3	18 litros de aceite para aspersiones agricolas, mas 1.5 kg/ha de Dithane M-45, que es suficiente para 0.4 litros por 4 replicaciones.
4	125 gramos de ingrediente activo por hectarea de Thiabendazole y Benomyl en 18 litros de emulsion de aceite para aspersiones agricolas, que es suficiente para 0.4 litros por 4 replicaciones.

Las aplicaciones se haran cada dos semanas, del 18 de Octubre de 1981, hasta el 30 de Abril de 1982. Una pulverizadora de bajo volumen sera usada, con el boquerel vertical.

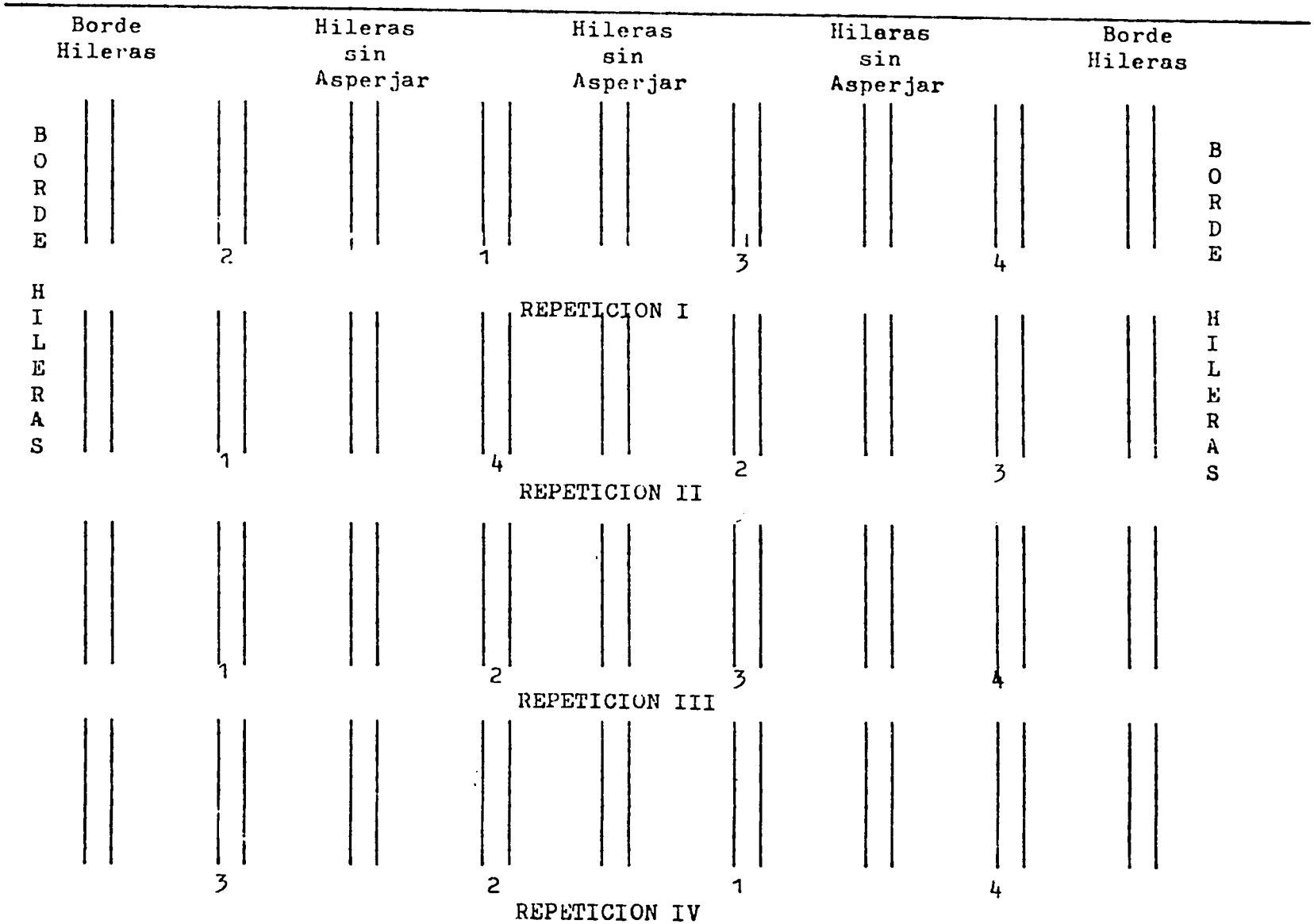
Tome el peso de los cachos para cada tratamiento, y cuente el numero de frutas en cada cacho. Quite las manos para clasificacion

como No. 1, No. 2 y los inferiores, pesando y anotando separadamente. Los datos deben incluir el tiempo que se necessita para pulverizacion de las parcelas, asícomo la información sobre el precio de las fungicidas y el equipo de pulverizacion. Se hara un analisis de las costas para determinar el beneficio o la perdida de pulverizacion de los bananos.

Aplique 100 gramos de urea, 100 gramos de superfosfato triple y 100 gramos de cloruro de potasio por planta cada seis meses.

DISPOSICION DE LAS PARCELAS EN ENSAYO DE FUNGICIDAS EN BANANOS EN 1981 - 82

VARIEDAD LACATAN - BLOQUES AL AZAR



DISPOSICION DE LA PARCELAS:

2 m entre hileras

4 m entre doble hileras

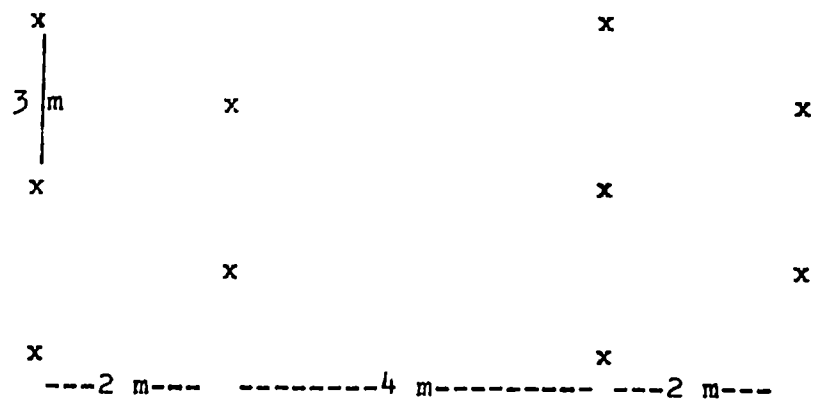
3 m entre plantas en las hileras

5 plantas por parcela

4 m entre repeticiones

6 m x 9 m = 54 m^2 por parcela

MUESTRAS DE PARCELAS



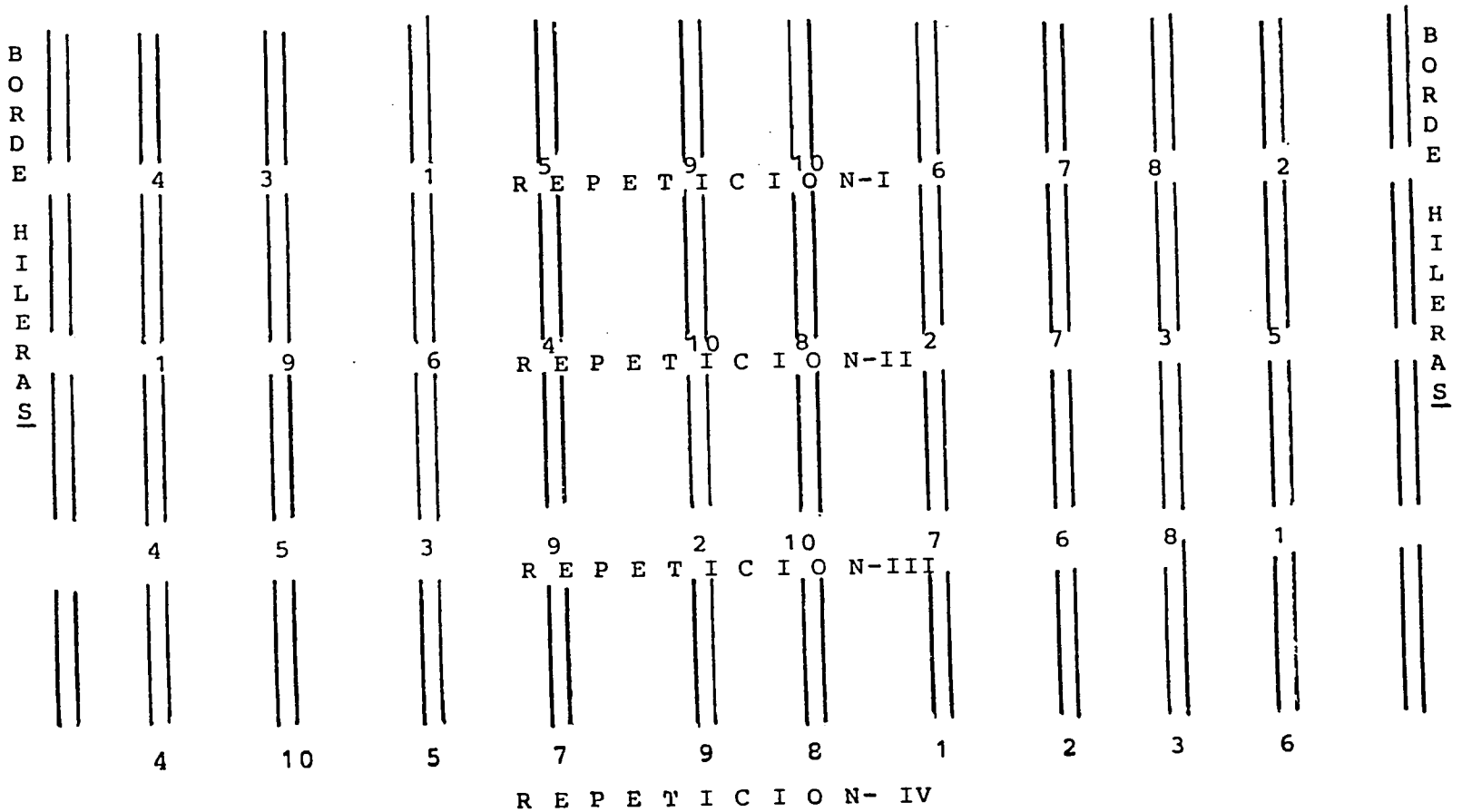
ENSAYO FACTORIAL COMPLETO DE N, P, K, Mg Y ELEMENTOS MENORES PARA PIÑA EN 1982

BLOQUES AL AZAR - VARIEDAD CAYENA LISA

Nº	TRATAMIENTO Kg/ha POR AÑO					GRAMOS POR PLANTA EN OCTUBRE				GRAMOS POR PLANTA EN ENERO 3/
	N	P_2O_5	K_2O	MgO	E.M.	Urea 46% N	SPT 46% P_2O_5	ClK 60% K_2O	OMg 12%	NPK 2/ +E.M.
1	0	0	0			0	0	0	0	0
2	0	0	348			0	0	6,5	0	0
3	0	48	0			0	1,2	0	0	0
4	0	48	348			0	1,2	6,5	0	0
5	136	0	0			13,3	0	0	0	0
6	136	0	348			13,3	0	6,5	0	0
7	136	48	0			13,3	1,2	0	0	0
8	136	48	348			13,3	1,2	6,5	0	0
9	136	48	348	32		13,3	1,2	6,5	12,0	0
10	136	48	348	32	B, Fe, Mn Mo, Zn	1,9	0	5,7	12,0	6,8

DISPOSICION DE LAS PARCELAS POR CADA ENSAYO FACTORIAL COMPLETO DE N, P, K, Mg

Y ELEMENTOS MENORES PARA PIÑA EN 1982 -- BLOQUES AL AZAR



** *** **** *** **

1/

E. M.	Kg/ha
B_2O_3	1,02
Fe_2O_3	9,69
MnO_3	1,02
MoO_3	0,17
ZnO	2,04

2/ Ortho Evergreen usado contiene:

Elemento	Porcentaje
N	10,0
P_2O_5	8,0
K_2O	7,0
B_2O_3	
Fe_2O_3	
MnO_3	
MoO_3	
ZnO	

3/ Aplicar la cantidad que se indica en una banda dos veces por año a 15 cm al lado de las plantas y una profundidad de 10 cm.

Distancia en la parcela: 60 cms entre hileras

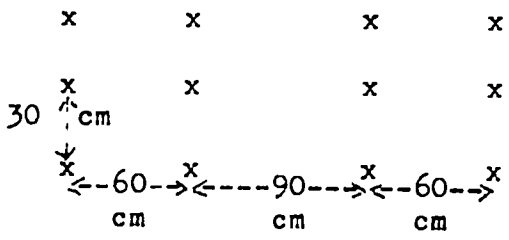
90 cms entre doble hileras

30 cms entre plantas en los surcos

6 plantas por hileras dobles, con surcos de 3 plantas cada una

1,35 m^2 por parcela

MUESTRAS DE PARCELAS



TAMAÑO DE PARCELA

0,90 m x 1,50 m = 1,35 m^2

Las frutas debieran ser clasificadas, pesadas y los datos anotados para cada parcela y las frutas contadas para determinar el tamaño promedio de la fruta.

Tome muestras de suelo antes de aplicar el fertilizante y muestras de hojas cada seis meses, para analisis.

ANEXO 11

RECOMENDACIONES DE LOS FERTILIZANTES BASADO EN ANALISIS DE LOS SUELOS -- PARA BANANOS

PRODUCTORES	GRAMOS POR PLANTA EN SETIEMBRE Y FEBRERO		
	UREA 46%	TSP 46%	KCl 60%
Daniel Kiscovich	150	100	150
Simeón Rolón	150	100	0
Antonio Escobar	150	100	150
Emilio Ramon Delgado	150	50	150
Apolonio Arzamendia	150	100	0
Claudio Portillo	150	100	150
Pedro Gimenez	150	100	150
Victoriano Casco	150	100	150
Isidro Emategui	150	100	150
Constantino Ovila	150	100	150
Atilio Avalos	150	50	0
Miguel Aguilar	150	25	0
Agustin Cohene	150	0	0
Urbano Román	150	100	150
Cirilo Burgos	150	100	50
Ambrosio Flecha	150	100	150
Amalio Aranjo	150	100	100
Domingo C. Gaona	150	100	150
Cirilo Benitez	150	100	150
Benito Garcete	150	100	150
Severiano Navarro	150	100	0
Armindo Román	150	100	0
Tomás Dávalos	150	100	0
Juan de la Cruz Frasqueri	150	100	0
Ricardo Frasqueri	150	100	0

ANEXO 12

RECOMENDACIONES DE LOS FERTILIZANTES BASADO EN ANALISIS DE LOS SUELOS -- PARA TOMATES

PRODUCTORES DE QUINDY	GRAMOS POR PLANTA AL MOMENTO DE TRANSPLANTE				GRAMOS POR CADA BANDA. BANDA 3 VECES	
	UREA 46%	TSP 46%	KCl 60%	25-019	UREA 46%	25-0-19
Juan Mancuello	11.8	11.8	0	0	1.5	0
Porfirio Mencia	0	23.6	0	21.6	0	2.7
Jose Eligio Melgarejo	11.8	23.6	0	0	1.5	0
Rodolfo Fernández	0	23.6	0	21.6	0	2.7
Ceferino Colmán	0	23.6	0	21.6	0	2.7
Juan B. Gaete	0	23.6	0	21.6	0	2.7
Sixto Sosa Esquivel	0	11.8	0	21.6	0	2.7
Manuel Alonzo	11.8	23.6	0	0	1.5	0

REDICOOP LTDA.

CENTRAL COOPERATIVA NACIONAL

BOLETIN No. 1

PRODUCCIÓN DE PIÑAS

1. Agricultor limpiando el área para plantar piñas.

1. Seleccionar una tierra que posea materia orgánica y arenosa con pH entre 5 y 6. No plantar piñas en tierras donde ya habían piñas en el año anterior, ya que los nematodos pueden bajar la producción.

2. Agricultor tomando muestra de suelo.

2. Tome muestras de suelo 3 meses antes de plantar. Consultar el Boletín Nº .....

3. Agricultor arando con bueyes.

3. Realizar la arada lo más profundo que sea posible.

4. Agricultor rastreando con la grada, con bueyes.

4. Nivelar el terreno arado en ambas direcciones.

5. Plantar en doble hilera en el contorno del terreno.

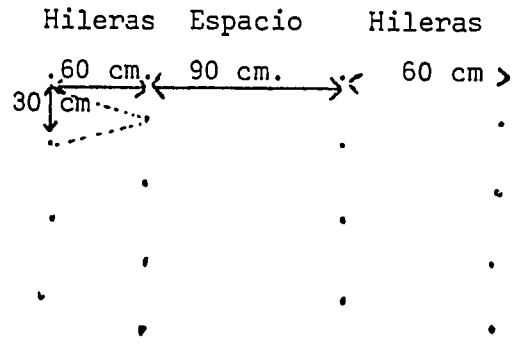
6. Seleccionar socas sanas y brotos de piña de la parte superior para plantar.

7. Empaparse las plantas con solución con 1,500 ppm de Nemacur antes de plantar.

8. Agricultor tratando las plantas con Nemacur.

8. Tratar las plantas con 0,2 gramos de Nemacur cada 2 meses si hay nematodos en la tierra.

9. Diagrama mostrando la distancia entre plantas e hileras:



9. Plantar en doble hilera en forma alternada (triangular dejando 90 cm. entre las dobles hileras para facilitar la cosecha. Esto permite 44.444 plantas por ha.

10. Agricultor abonando las plantas.

10. Aplique 4,4 gramos de urea, 1,7 gramos de superfosfato triple, 6,7 gramos de cloruro de potasio y 2,0 gramos de óxido de magnesio por planta. Cuando está plantando en bandas laterales a 10 cmts. al lado de la planta, y 10 cmts. en un surco debajo del suelo.

11. Agricultor protege las piñas.

11. Proteger las plantas con el bagazo de la caña de azúcar, estiercol verde o paja organica para control de las malas hierbas y reducción de pérdida de humedad. Puede usar el polietileno negro si es posible.

12. Agricultor tomando Muestra 12. de la hoja de la planta.

12. Cortar la parte baja de la cuarta hoja para muestras de las hojas. Usar 20 plantas por Ha. tome una muestra cada 6 meses.

13. Agricultor cortando las muestras de hoja y poniendo dentro de una bolsa de polietileno.

13. Cortar las muestras de hoja en pedazos de 2,5 cmts. y poner dentro de una bolsa de polietileno.

14. Agricultor poniendo una etiqueta dentro de la bolsa con su nombre y dirección.

14. Ponga una etiqueta dentro de la bolsa de polietileno con el nombre y la dirección del agricultor.

15. Agricultor atando la boca de la bolsa con otra etiqueta.

15. Agregar otra etiqueta más con el nombre y la dirección del agricultor fuera de la bolsa de polietileno.

16. Los niveles optimos para los nutrientes de las hojas (% materias secas) para "Cayena Lisa" en Puerto Rico:

N	1.6	- 1.9
P	0.16	- 0.20
K	1.8	- 2.5

16. Cuando los resultados de los análisis de las muestras estañ abajo de los niveles optimos, aplique los nutrientes necesarios.

17. Aplique acetileno cuando el 60% de las plantas tienen señales de la inducción natural.

18. Agricultor aplicando acetileno.

18. Aplique 100 ml. de la solución saturada de acetileno para hacer la inducción floral durante la noche.

19. Cubrir las frutas pequenas para proteger contra danos de la helada, el sol, los pajaros y los ratos.

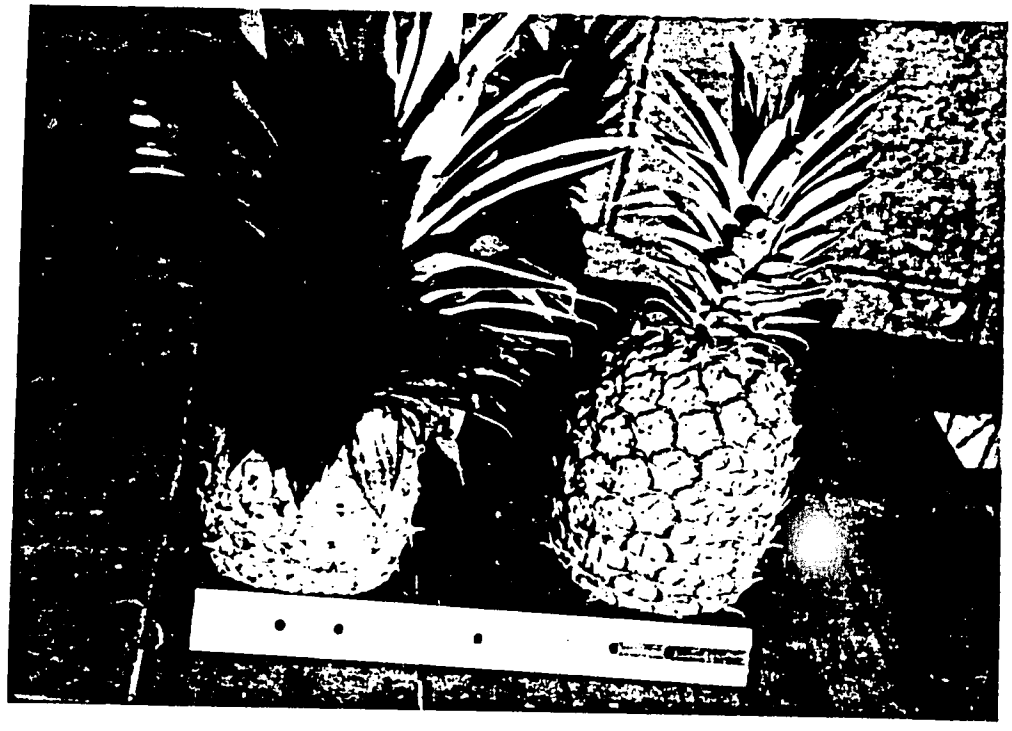
20. Agricultor sacando el meristema de hojas de la fruta.

20. Sacar el meristema de la fruta cuando la corona tiene 8 cmts. de largo, para reducción del tamaño para transporte.

---

21. Agricultor asperjando para controlar de las hormigas.

21. Aplique aspersión de Malation a las 6 hileras dobles al borde del cultivo para controlar las hormigas, y para disminuir la población de Mealy bugs que pueden producir marchitamiento.



22. Corte las frutas cuando están medio maduras, si serán para exportación.

BOLETIN No. 2

PRODUCCION DE FRUTILLAS

1. Un agricultor mirando su chacra

1. Selección de muestra bien drenada de suelo con bastante arena de alto nivel de materia orgánica.

2. Tomando reconocimiento del suelo

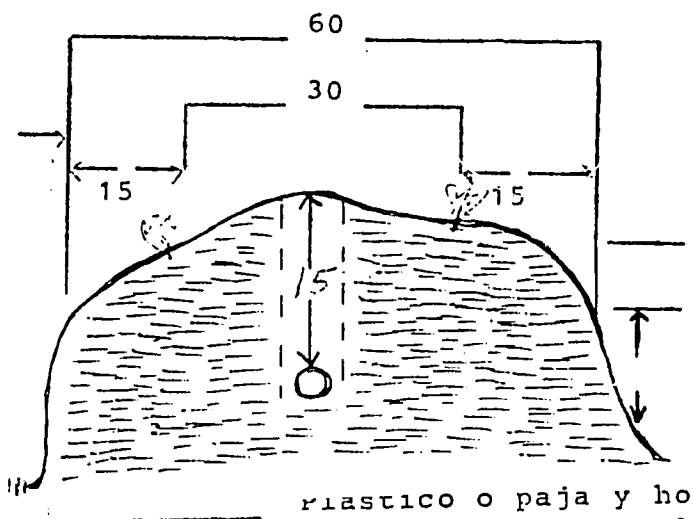
2. Tomar las muestras para análisis tres meses antes de sembrar consultar el boletín sobre muestra de suelos por análisis.

3. Agricultor aplicando fertilizantes al voleo antes de plantar

3. Se aplica 80 kg. de úrea, 107 de superfosfato triple, 83 kg de cloruro de potasio al voleo por 1/2 há, y rastrear luego el suelo.

4. Agricultor haciendo un tablón

4. Los tablones deben estar separados del centro de uno al centro del próximo, por 120 cm.



Plastico o paja y hojas
Fertilizantes al voleo
Fertilizantes en Bandas

0 Banda

5. Se hacen las tablón con una profundidad de 15 cm ~~y 120 cm de las centros~~ des ~~las tablóns~~.

6. Agricultor aplicando fertilizantes en bandas en el centro del tablón

6. Aplicar 28,8 gramos de urea, 38,5 gramos de superfosfato triple y 19,7 gramos de cloruro de potasio en bandas en el medio del tablón por cada 10 plantas.

7. Agricultor poniendo el plástico negro sobre el tablón y cubriéndolo con suelo en ambos lados.

7. Ponga plástico de polietileno o paja sobre los tablones justo antes de plantar para combatir las malas hierbas, calentar el suelo y mantenerlo húmedos.

8. El agricultor lleva en la mano las plantas que debe cultivar.

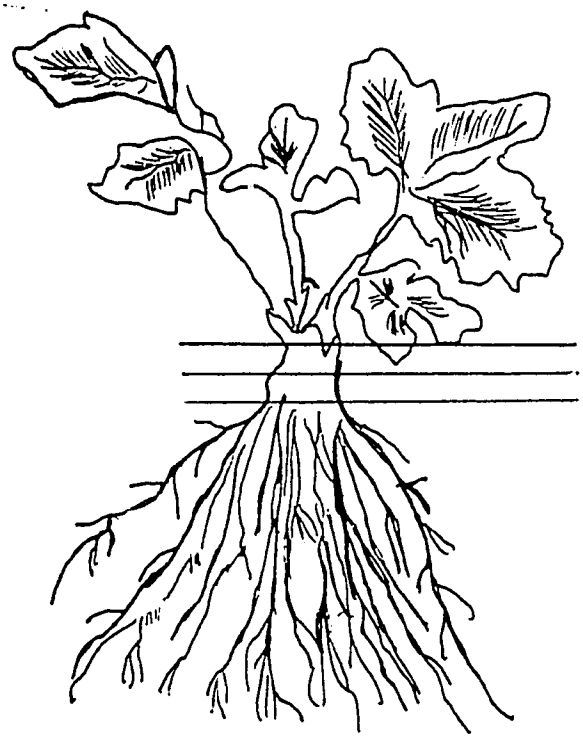
8. Transplante variedades de alto rendimientos como campinas 1712.

9. Agricultor transportando plantas con con raices mojadas.

9. Cuando se cambian las plantas del vivero a la chacra no debe hacerse con raices secas.

10. Agricultor con una planta de raíces esparcidas.

10. Se hace un pequeño agujero en el plástico y allí se transplantan a 30 cm. entre plantas e hileras con las raíces esparcidas.



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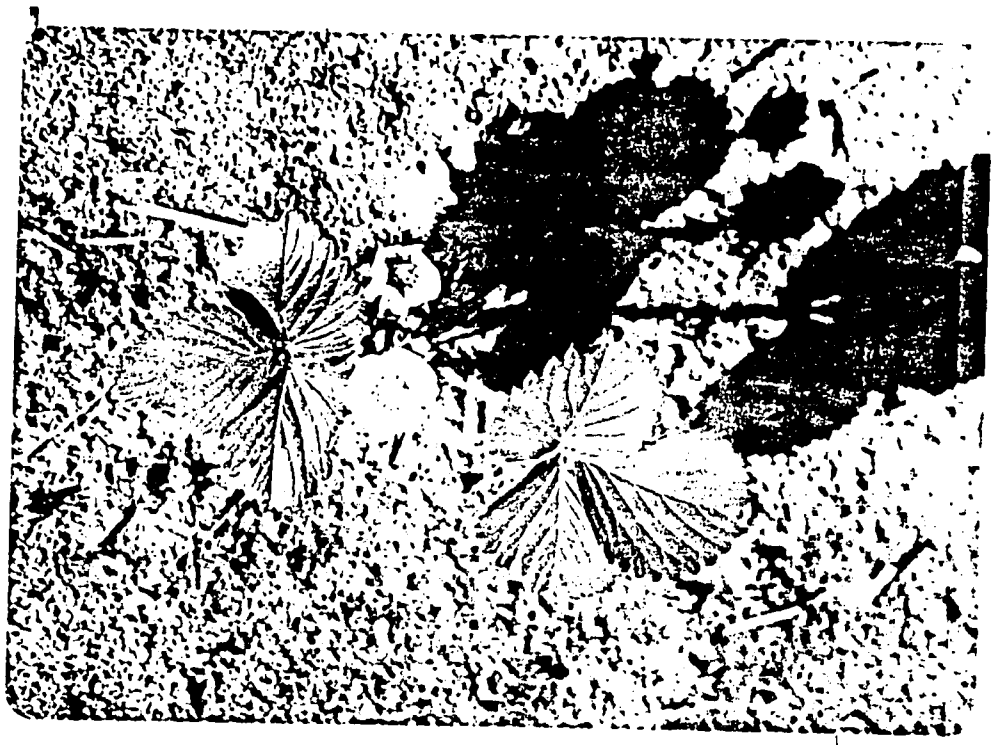
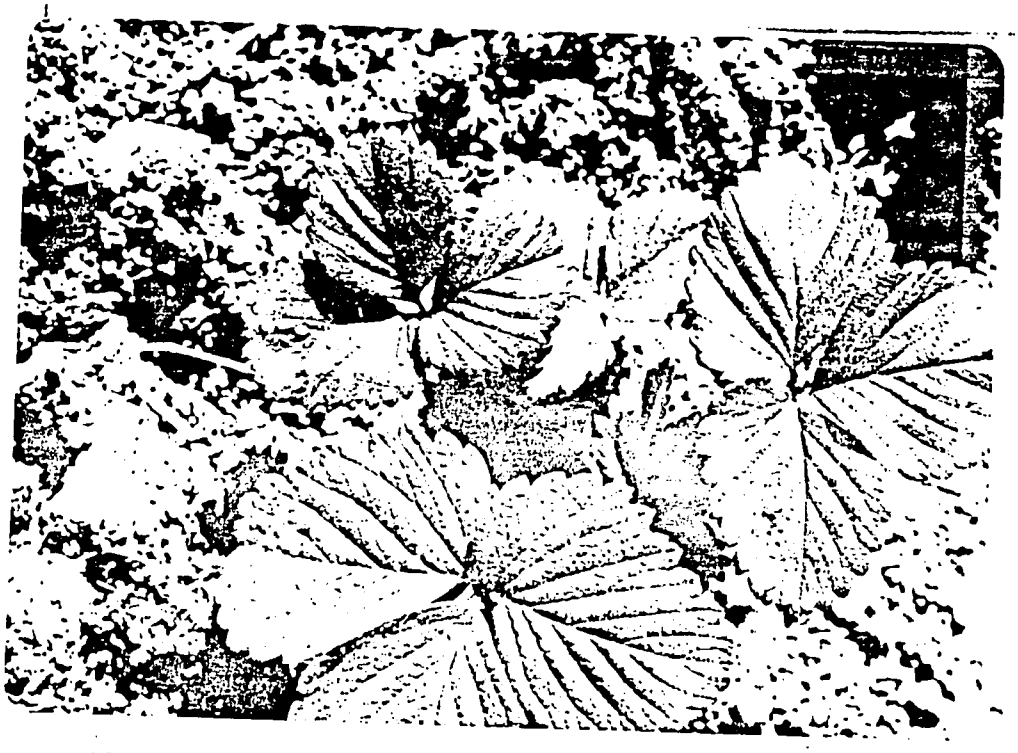
11. En el mes de mayo se colocan las plantas a la profundidad correcta.



12. Se producen las flores más efectivamente en las noches frescas y días cortos de invierno.



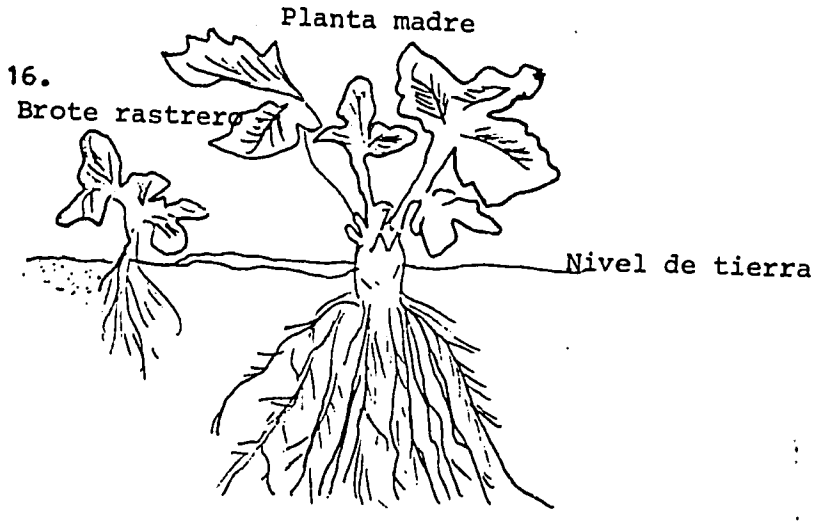
13. Aplicar 57 gramos de ziueb en 20 litros de agua cada semana antes de la frutificación; ya no se emplea dentro de los 7 días antes de la cosecha.

14. Foto de la fruta

14. Las flores crecen y dan fruto en un mes.

15. Foto de la cosecha

15. Se cosecharan cuando los frutos estén rojos.



16. Durante el verano con la ayuda de los días cálidos y largos, nacen en las plantas brotes rastreros y se forman nuevas plantas.

17. Foto de replante o reposición

17. Se reponen las palntas cuando el rendimiento es bajo a causa del los virus nemátodos y otras enfermedades.

INTENTIONALLY

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BOLETIN No. 3

PRODUCCION DEL BANANO

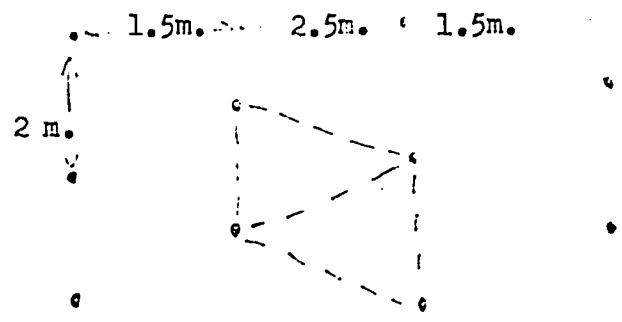
1.AGRICULTOR LIMPIANDO AREA PARA PLANTAR BANANA

1. SELECCIONE SUELO CON MENOS DE 40 % DE ARCILLA, pH ENTRE 6 Y 7.5 , Y LA NAPA DE AGUA MAS ABAJO DE 1 METRO SI ES POSIBLE.

2. AGRICULTOR TOMANDO MUESTRA DE SUELO, ENSEÑANDO MUESTRA AL AZAR Y PROFUNDIDAD

2. TOME MUESTRA DE SUELO A 15 CM. DE PROFUNDIDAD, 3 MESES ANTES DE PLANTAR BANANOS. VEA BOLETIN SOBRE MUESTRA DE SUELOS PARA ANALISIS.

3. DIAGRAMA MOSTRANDO LA DISTANCIA ENTRE PLANTAS Y HILERAS:



3. PLANTE DOBLE FILA EN FORMA ALTERNADA O TRIANGULAR, DEJANDO 2.5 m. ENTRE DOBLE FILAS. ESTO PERMITE 2500 PLANTAS POR HA.

4. AGRICULTORES PLANTANDO RIZOMAS

4. PLANTE RIZOMA DE " GIGANTE CAVENDISH " ENTRE SEPTIEMBRE Y DICIEMBRE.

5. AGUA CALIENTE ESTA UTILAZADAA PARA TRATAMIENTO DE RIZOMAS ANTES QUE ESTOS SEAN PLANTADOS

5. PONGA RIZOMAS POR 20 MINUTOS EN AGUA CALIENTE A 60 ^{o} C .

6. PREPARACIÓN DE DESINFECTANTE (FURADAN)

6. PONGA RIZOMAS POR 5 MINUTES EN UNA SOLUCÍON HECHA DE 250 GRAMOS DE FURADAN DISUELTOS EN 100 LITROS DE AGUA .

7. FOTO DE RIZOMAS SECANDOSE

7. SEQUE RIZOMAS (SIN AMONTONARLOS) PARA EVITAS QUE ESTOS SE PUDRAN .

8. RIZOMA SANO EN EL PROCESO DE PLANTACION SIENDO ENTERRADO SU PARTE ABAJO.

8. SELECIONE RIZOMAS SANOS (LIBRE DE GORGOJO DE BANANA) QUE PESEN ENTRE 600 Y 800 GRAMOS Y QUE TENGAN 1 O 2 YEMAS .

9. AGRICULTOR RELLENANDO HOYO CON MEZCLA DE SUELO Y ESTIÉRCOL

9. RELLENE HOYO CON MEZCLA DE SUELO Y 3 A 5 KG. DE ESTIÉRCOL. CUBRA LOS RIZOMAS CON 10 CM. DE LA TIERRA .

10. AGRICULTOR EXCAVANDO HOYO 30 CM. DE ANCHO , 30 CM. DE LARGO , Y 30 CM. DE PROFUNDIDAD . MUESTRE LAS DIMENSIONES CON UNA REGLA.

10. LOS HOYOS DEBEN TENER 30 CM. DE ANCHO , 30 CM. DE LARGO , Y 30 CM. DE PROFUNDIDAD .

11. AGRICULTOR PONIENDO PIEDRA DE LOMITICA EN EL HOYO.

11. PONGA 100 GRAMOS DE CAL EN EL HOYO SI EL pH DEL SUELO ESTÁ DEBAJO DE 5.5 , Y 100 GRAMOS DE SUPERFOSFATO TRIPLE , MAS 50 GRAMOS DE FURADAN.

12. AGRICULTOR ENTRESACANDO PLANTAS DE BANANO CON PALITA O MACHETE .

12. ELIMINE' TODOS LOS HIJUELOS QUE SEAN MENOR DE 30 CM. , CON EXCEPCIÓN DE SI TRES TES UNO EN FLORACION(O QUE TIENE FRUTA) , UN HIJO DE ESTE , Y UN NIETO DEL MISMO. USE UNA PALITA O MACHETE PARA REMOVER LOS CHUPONES CADA 2 O 4 MESES.

13. AGRICULTOR APLICANDO UREA.

13. APLIQUE 100 GRAMOS DE UREA POR PLANTA DESPUÉS DE 3 MESES.

14. AGRICULTOR APLICANDO CLORURO DE POTASIO

14. APLIQUE 100 GRAMOS DE CLORURO DE POTASIO DESPUÉS DE 9 MESES.

15. AGRICULTOR APLICANDO UREA Y CLORURO DE POTASIO

15. APLIQUE 50 GRAMOS DE UREA MAS 150 GRAMOS DE CLORURO DE POTASIO DESPUÉS 9 MESES.

16. AGRICULTOR APLICANDO CAL.

16. APLIQUE CAL SEGUN LA FORMA SIGUIENTE:
pH 4.0 - 2.0 KG./ MATA
pH 4.5 - 1.2 KG./ MATA
pH 5.0 - 800 GRAMOS / MATA
pH 5.5 - 400 GRAMOS / MATA

17. AGRICULTOR DANDOLE APOYO AL TALLO CON UNA TACUARA

17. COLOQUE UNA TACUARA DEBAJO DEL SEUDOTALLO PARA DARLE APOYO A LOS CACHOS PESADOS.

18. DESFLORE LOS CACHOS POCO TIEMPO DESPUÉS DE FLORACIÓN , QUITANDO LAS FLORES MUERTAS QUE PUEDAN DAÑAR LA FRUTA.

19. AGRICULTOR QUITANDO HOJAS QUE ESTAN EN CONTACTO CON LAS CACHOS.

19. CORTE TODAS LAS HOJAS QUE ESTAN EN CONTACTO CON LOS BANANOS , YA QUE ESTOS SE DAÑAN POR EL CONTACTO.

20. AGRICULTOR COLOCANDO TIERRA ALREDEDOR DE LA MATA.

20. COLOQUE TIERRA ALREDEDOR DE LAS MATAS CUANDO SE ANTICIPA FUERTES VIENTOS.

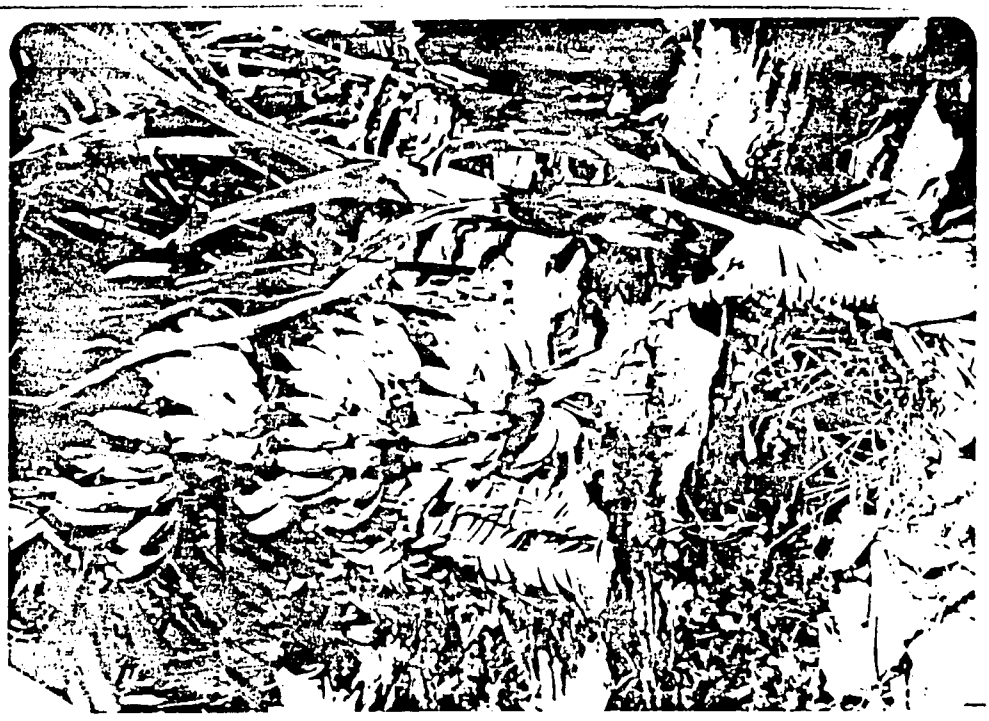
21. AGRICULTOR CORTANDO YUYOS CON MACHETE.

21. QUITE LAS MALAS HIERBAS DEL BANANAL CADA 2-4 MESES.

22. AGRICULTOR APLICANDO HERBICIDA.

22. MEZCLE 80 ML. DE PARAQUAT (GRAMOXONE) CON 20 LITROS DE AGUA Y ASPERJE LAS MALAS HIERBAS. NO APLIQUE CUANDO HAY VIENTO ; USE 3 LITROS/HA.

23. APLIQUE CADA 21 DIAS CON ACEITE MINERAL AGRICOLA Y DITANO M-45(1.5 KG) CON 7 LITROS POR HA. DESDE NOVIEMBRE HASTA EL FIN DE ABRIL.



24. QUITE FLOR MASCLINA CON MACHETE ANTES DE PONER CACHO EN EL BOLSA (DE POLIETILENO).

25. AGRICULTOR QUITANDO LA ULTIMA MANO DE FRUTA.

25. QUITE LA ULTIMA MANO DEL CACHO, YA QUE ESTÁ GENERALMENTE NO ES COMPLETA.

26.AGRICULTOR CUBRIENDO EL CACHO CON UNA BOLSA DE POLIETILENO.

26. CUBRA EL CACHO CON BOLSA DE POLIETILENO PARA PROTEGERLO DEL FRIO,SOL, POLVO,RESIDUOS DE HERBICIDA, INSECTOS, Y DE PÁJAROS.

27. AGRICULTOR CORTANDO UN CACHO DE BANANOS.

27. CORTE EL CACHO CUANDO ESTÁ 1/4 - 3/4 LLENO, SEGUN DEL MERCADO.

28. AGRICULTOR DESINFECTANDO BANANOS.

28. LIMPIE BANANOS DURANTE 8 MINUTOS PARA QUITAR EL LATEX, Y COLOQUE EL CACHO EN 100 LITROS DE AGUA CON 100 GRAMOS DE TOPSIN O MANEB.

CREDICOOP LTDA.

CENTRAL COOPERATIVA NACIONAL

BOLETIN No. 4

TOMANDO MUESTRAS DEL SUELO

1. Diagrama de como seleccionar muestras de suelo al azar.

1. Tome 9 a 15 muestras de suelo por media hectárea, y mezcle en un balde.

2. Agricultor con palada tomando muestras de suelo.

2. Desentierre el suelo hasta 15 cm. de profundidad.

3. Agricultor con machete tomando muestras de suelos.

3. Rebane una muestra de suelo con el machete, de 15 cm. de profundidad.

4. Agricultor poniendo muestra de suelo en un balde.

4. Ponga la muestra de suelo en un balde.

5. Agricultor tomando otra muestra de suelo.

5. Tome 9 a 15 muestras de suelo por media hectárea.

6. Agricultor mezclando las muestras de suelo en un balde.

6. Mezcle bien las muestras de suelo en un balde.

7. Agricultor poniendo muestras de suelo en una bolsa plástica.

7. Mezcle bien la muestra adentro de la bolsa con el nombre y la dirección del agricultor.
Ponga una etiqueta adentro de la bolsa plástica.

8. Agricultor amarrando la bolsa con otra etiqueta afuera.

8. Amarre la bolsa plastica con otra etiqueta afuera, con el nombre y la dirección del agricultor.

9. Agricultor entregando la bolsa al hombre de la cooperativa.

9. Entregue la muestra a un socio de la cooperativa para que éste la lleve a un laboratorio de suelos.

10. Agricultor reseñando los resultados del análisis.

10. El análisis de suelo está recibido antes de plantar.

11. Agricultor mirando los abonos, mostrando % de los elementos en urea, triple superfosfato y cloruro de potasio.

11. Aplique el abono como recomienda el científico de suelos.