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STUDY OF LAND RECLAMATION OF THE VIEDMA VALLEY PROJECT

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RIO NEGRO PROVINCE

APPRAISAL OF THE PHYSICAL COMPONENTS RELEVANT TO THE AGRICULTURAL DEVELOPMENT OF THE LAND

(SOIL FERTILITY FINAL REPORT)

SOIL INVESTIGATION DATA

FOOD AND AGRICULTURE ORGANIZATION OF THE UNITED NATIONS AND U. N. D. P. (SPECIAL FUND)

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(Soil Fertility Final Report)

BY

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A P P E N D I X - II

EXPERIMENTAL RESULTS AND DISCUSSIONS IN RECLAMATION AND FERTILIZERS

STATEMENT

These Experiments were conducted for the first time in the Viedma Experimental Station.

The results they have produced are the guidance and the first indication for the Area specially in Reclamation treatments and Fertilizer limits.

They are unique in showing how the theoretical methodology shift in field application. The time lag between calculated results obtained in well controlled experiments and actual results obtained on the spot, when the application is performed in the field and under the daily working natural farm conditions can explain the shift in the sound theories of reclamation and the time it takes to apply it. During that time so many reverse reactions take place.

The results of these Experiments are worth serious world consideration specially in the field of applied reclamation.

M. K. Radway

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LYSIMETER

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T E X T

EXPERIMENTAL RESULTS AND DISCUSSIONS IN RECLAMATION AND FERTILIZERS.

A great number of experiments were conducted in the Viedma Experimental Station, and Table N°1 gives the list of the 19 Experiments which have been initiated and their locations. They were part of the 30 Experiments designed of the Viedma Project. In this connection the reader is invited to study the detailed description of these Experiments in Volume III.

The results of these experiments were encouraging, as they prove that the productive capacity of the soils of the Viedma Valley can be elevated as presented hereafter in their corresponding sections. It is worth mentioning that some of the salt affected soils were planted with 360 wind break trees (alamos) in April 1967, after the soils have been reclaimed in Block 2 of the Reclamation Field of the Station. The trees show 100% success and were healthier and 1 - 2 times taller than other 2 or 3 years older. In addition some other field plots were turned after being reclaimed to fertilizer experiments for Barley and Alfalfa (Exp.18), in Blocks 1 and 2 of the Reclamation Field (Please see Table N° 1).

Soils of the Project can be reclaimed with variable degrees of response to the leaching processes and the Loma soils require the longest time of all other series. Leaching can be done with 1-4 and sometimes up to 8 feet depth of water to accomplish the process.

Gypsum amendment is needed as required and the doses are neither costly nor high. From less than one to 8 T/H gypsum amendment is needed depending upon the degree of the harmful excessive salts present and the depth required to be reclaimed.

Fertilizers can give maximum possible yield up to 44.90 T/H fresh weight of combined crops of alfalfa and barley seeded together upon the application of 300 Kg/H Nitrogen. Phosphorus gave good results of 10.74 T/H fresh weight of alfalfa upon the application of 100 Kg/H. P_2O_5 .

Potassium results are not yet defined due to interaction and magnesium presence in excessive quantities on the exchangeable complex.

1. Lysimeter Experiments on 8 different series of the Project.

A lysimeter experiment has been designed to study the reaction of 8 different soli series of the Project under reclamation process (Vol.III - Part 5).

Upon the application of water alone or water plus gypsum in small doses to the soil surface in these Lysimeter cases, and according to the field operation program which has been designed for that purpose, the following few remarks have been conclu - ded. The results were very encouraging and the reader is invited to check the corresponding Tables from 2 to 23 , and Figs. from 1 to 11 for more additional conclusions.

1.1 Application of 20 cm.of water depth in 1 - 4 doses

Changes in soil properties under reclamation show thereis a decrease in the water saturation percentages close to about 20 %, and a slight decrease in the exchangeable soil properties.

The rate of decrease in the soil properties is smaller in the lower layers than in the upper layers .

The soluble cations of the saturation extract show a stronger picture of reduction in elemental content than the exchangeable cation content.

The total soluble salts, total cations and total anions show faster decrease in content in the upper layer 0 - 30, than in the lower layers of 30 - 60 or 60 - 90 cm.

1.2 Application of water plus gypsum in 1-4 doses

When gypsum is incorporated in the process of re - clamation all the changes in soil chemical and physical properties are accelerated. Even the changes for example in the gypsum content of the soil,show sometimes as much as 75% reduction between the original value and the second leeching(Pr.368,Se.03.2).

The least change that takes place is in the available P_2O_5 which show some increase, then decrease upon the successive application of water. This fact can be explained that the total calcium quantity in the active form in the soil balances the activity of the available phosphate, thus resulting in a temporary no fixation or release.

1.3 Reactions and changes in the percolated water.

The percolated or leachate water has been collected every two hours and until the percolating water ceased after each given irrigation, and the results show that total soluble salts, total anions and total cations reduce with water and water plus gypsum amendment.

The rate of reduction in salt and water properties is close to the changes in the soil saturation extract than it is to the exchangeable colloidal properties. Charts presented in Fig.1 - 11 show the decrease which took place in this Lysimeter expe - riments. It also shows that according to the va - riability of soil properties, their response is different and is being reflected in the rate of salt content in the leachate water for these 8 different series.

PART I . RECLAMATION EXPERIMENTS

2. Field Experiments

The results of the different reclamation experiments which were conducted in over 150 plots for the different reclamation treatments indicated that the soils can be reclaimed.

Table No.24 presents a randomized extract of some different plots which belong to the different types of salt affected soils and at different depths; and in their corresponding Field Calendar the different treatments given to these plots were cited with the corresponding dates. Discussion of the results of each plot is also taken care of separately and presented afterwards.

In the Primera Etapa, as mentioned in Appendix I Volume II, the salinity maps indicate that the salts are higher in the lower layers than in the top soil layers. And the process of reclamation must be carried out to ensure a margin reduction in salt concentration in the lower layer of 60 -90 cm; otherwise salt will invade the upper layers upon the application of water as shown from the results obtained in the Station.

These experiments gave the following general conclusions:

2.1 General Conclusions of all Field Experiments

Saline soils can be reclaimed with the addition of different depths of water between 1-4 feet. And in some soils about one foot depth of water can reduce total salts up to 80-90 % of its original quantity.

Light alkaline and saline soils will require the addition of gypsum. And the map of gypsum requirement of the Primera Etapa indicates the quantity calculated for each location (Appendix I, Volume II).

Alkaline soils resists leaching strongly and sodium cannot be removed from the soil unless it is neutralized.

The chief forms of alkali present in the Project soils are sodium carbonates, sodium sulphate and sodium chloride.

Neutralizing of the sodic soils with gypsum before leaching causes the saving of plant food and the determination of the toxic limit of black alkali under field conditions is difficult.
In some places plants are doing well in a concentration of alkali that is proving detrimental (by analysis) as determined by the soil sample analysis taken at different depths of the root zone.

When the process of reclamation stops or is interrupted for 3 or 4 months, salts can be increased by about 50% more than the original value.

Reclamation with gypsum dissolved in water will show faster results in the upper and even middle 0-30, 30-60 layers than the results obtained when water is added alone and gypsum is broadcasted and followed by water.

Loma soils (Series 08.2) shows the least response to reclamation; some parts will require something around 8-12 feet of water before the salts can be insured to have been pushed downwards in the soil.

The addition of gypsum is a must as most of these loma soils are saline alkaline and make about 20% of the area of the Primera Etapa.

Gypsum obtained from Allen or Cinco Saltos of the Upper Valley has a good quality and it was used to reclaim the soils in the Experimental Station.

After gypsum treatment, it is vital to give the least tillage operation. A legume to follow and plowed under to give a pulse to the soil's capability, is vital.

Addition of gypsum on the surface even in greater quantities than necessary as calculated will help tolerate more concentration of toxic sodium in the subsoil.

Chemical amendments should not be considered an expensive item for reclaiming the soils of the Project in relation to other farm costs involved for colonization aspects.

Reclamation with Organic Matter is a very slow process, and its results can be offset inmediately by the effect of wind and fast evaporation, thus bringing the salts up again along with the upward movement of water.

Pot culture experiments should be adopted or at least coupled with field applications, to give a quick practical clue on how different soils known for high toxic percentage of black alkali will react to different plants, forages and vegetables before a large scale plan can be undertaken

The salinity and alkalinity changes, as well as the field calendar and discussions of specific conclusions pertaining to some randomized plots are presented at the end of this Appendix, (Tables 43 - 54, A,B and C).

3. Response of saline and alkaline soils to different treatments.

Soil salinity and alkalinity with respect to their degrees, their combinations and their location in the 3 respectiva depths, 0-30, 30-60 and 60-90 cm. conclude the following: when small quantities of gypsum were applied with only one foot depth of water on the soil surface (Tables 25-3E) :

1) Whatever the quantity of total soluble salts may be on the surface layer, between 26 and 8 mmhos/cm, one foot depth of water with gypsum at the rate of 0.5 T/H removes 90% of the salts and about 80% of the salts in the first and second 30 cm layers succesively.

2) Up to 21 mmhos salinity which is very high and very high alkalinity in the medium layer 30-60 cm. one foot of water impregnated with 0.4 T/H gypsum when applied on the surface soil canreduce both salinity and alkalinity to a fairly good level . Plot 43.

3) High salinity and alkalinity in only the upper layer, can be recovered and the recovery can even be extended to the depth of 90 cm. by the applica - tion of one foot depth of water in which 0.5 T/H gypsum has been dissolved. Over 90-80 % of the total salts and up to 53% of the Exchangeable Na can be removed as in PLOT 46.

4) One foot of water in which gypsum has been dissolved at the rate of 0.4 T/H has reduced the total soluble salts expressing a value of 26 and 21 EC in the depth of 0-60 cm to a value of 4 mmhos; about 92,or 80% salts has been removed. At the same time the alkalinity has been highly increased in the lower layers as in PLOT 43.

5) Moderately high salinity (restricted to tolerable crops) with marginal alkalinity will turn to higher salinity and strong alkalinity in the 3rd .

layer as the total salts increased by about 20% than its original value and the exchangeable so - dium percentage is increased by 266% its original value in the 3rd. 60-90 cm layer when only one foot of water with 0.4 T/H gypsum dissolved is applied on the top of the 1st. cm. layer. PLOT 43.

6) When gypsum is dissolved in one foot of water up to and at the rate of 0.9 T/H and applied to the surface of the soils,it will cause a reduction in total soluble salts and exchangeables sodium percentage to a very good extent in the upper layers. However in the lower layers total soluble salts will be increased from 14% to 379% and the exchangeable sodium percentage, can be increased up to 320% . PLOT 47.

The process has to be continued further to insure the recovery of the 2nd.layer and to prevent the increased danger in the 3rd. layer.

Small doses of gypsum cannot do better even for marginal alkalinity and the exchangeable Na % can be increased by 305% its original value.PLOT 45.

3.1 Response of the 90 cm.depth of soil treated with gypsum dissolved in one foot depth of water .

When the entire depth of 90 cm is taken as one unit and the salts were averaged throughout that depth, the changes in total soluble salts and the exchangeable sodium percentages were different and gave the results, as reported in Table 31 ; and the following main conditions can be drawn:

1) The average increase in total salts and in exchangeable sodium percentage is only due to the accumulation of salts in the last 60-90 cm.layer.

2) Marginal salinity and marginal alkalinity has been increased upon the application of 0.5 T/H gypsum dissolved in one foot of water. PLOT 44.

3) Moderarely high salinity (restricted to tole - rant crops). (Between 8-16 mmhos) with:

a) Tolerable alkalinity can be improved to suit sensitive crops with one foot of water with 0.5 T/H, gypsum dissolved. PLOT 46.

b) Tolerable alkalinity can turn to marginal alkalinity with 0.9 T/H gypsum when applied with one foot of water. PLOT 47.

c) Very high alkalinity will turn to a strong alkalinity in soils with only 0.3 T/H gypsum applied in one foot of water. PLOT 45.

4) Very high salinity and very high alkalinity can turn to strong alkalinity soils with also marginal salinity if they receive only one foot of water with about 0.4 T/H gypsum. PLOT 43.

5) Small doses of gypsum can reclaim the upper layer only with one foot depth of water but cannot ensure reduction in either salts or exchangeable sodium percentage in the lower layers. It will require either additional quantities of water or additional quantities of water plus a higher dose of gypsum to recover the entire 90 cm.depth of soil. This will depend upon the original degree of salinity and alkalinity their depths and their combinations.

4. Loma Investigations . The following are some results of the Loma Series No.08.2 of the Project. -

Regardless of any previous treatment in about half a year and with the application of water which was calculated roughly to be about 6-8 feet of water, the results of some soils of the Loma Series No. 08.2 are recorded in Table No.33 Field Calendar in Tables 1-8. These mostly saline alkaline soils were treated with 1, 2, 3 and 4 feet of water applied to the soil with and without different quantities of gypsum. The variability of these results can show clearly that every locality should be considered as a separate identity and what is proven to be conclusive for one spot might not be so for the adjacent soil due to different soil physical property and layer separates and sequences. These saline alkaline soils and their behaviour under such treatments can support the following main conclusions:

4.1 Application of 4 feet depth of water with and without gypsum.

When 4 feet of water applied at different times throughout a year period with the application of gypsum, at the rate of 1 T/H, as in Subplot 16 C I, the total soluble salts has been increased by about 26 % more than before in the upper layer of 30 cms. and the reduction is shown to be no more than 17 or 28 % in the successive lower layers. However the total salts are still limiting and show gradual increase downward.

With regard to the exchangeable sodium percentages it is noticed that only 5% decrease took place on the surface layer an no more than 32 % has been removed in the lower layers. And the sodium exchangeable values are still very limiting.

Subplot 17 C I which only received 4 feet of water and no gypsum was added, shows the following reactions:

This Subplot turned to be more saline alkaline than before as the result of water application alone. The salts have been increased throughout the profile by values which range between 163, 116 and 35 % more thanthe original values in the layers of 60-90 cm., 30-60 cm. and 0-30 cm. successively.The exchangeable sodium percentage also has been increased up to a value of 11 % more than its original value.

Therefore when gypsum is required to reclaim the soil and was denied both total salts and exchangeable sodium percentage will be increased than before and the danger is more pronounced in the lower layers than in the upper ones.

4.2 Application of three feet depth of water with and without gypsum.

In soils where high salinity is only in the lower layers and alkalinity is excessive throughout the depth down to 90 cm. as in Subplot 17 C II, three feet of water reduces the total soluble salts only in the first 30 cm. layer. In the second 30 cm.layer as well as the third, the rate of reduction was less in comperison with the first.

The exchangeable sodium percentage was also reduced in the first 30 cm. layer to a good level, and in the two lower layers the rate of reduction was less, about 40 %.

When gypsum was added at the rate of 3.8 T/H to soil even with greatersalinity and more alkalinity, the total soluble salts has been reduced to a more satisfactory level. About 84 % of the salts has been removed in the first 30 cm. layer and 92 % in the second 30 cm. layer and 75 % in the third 30 cm. layer. The entire depth can be considered as free of harmful salts.

The exchangeable sodium percentages has also been reduced than before although the soil show that it still needs the treatment to be carried further. This condition can be presented by Subplot 16 C II.

4.3 Application of two feet of water with and without gypsum.

The application of two feet of water only to the saline alkaline soil in the loma series, reduces the total soluble salts in the top layers, while in the lower third layer the salts has been increased by 100 %. The exchangeable sodium percentages although thay have been reduced by about 50 % in the upper 60 cm. layer, yet it is still limiting all through the three depths and has been increased by 257 % more than its original quantity in the third layer. This case is noticed by Subplot 18 C II .

Subplot 19 C II received the same treatment as Subplot 18 C II except the latter has also received gypsum at the rate of 3.8 T/h.

The reduction in salt content is noticed in the first 30 cm. layer, while the other two following layers still need the treatment to continue. The addition of gypsum shows a considerable reduction in the exchangeable sodium percentage throughout the profile. Nevertheless the reclamation treatment has to continue.

4.4 Application of one foot depth of water with and without gypsum.

The application of one foot of water has caused a depth of 2 feet of soil to be free of harmful salts to a good level.

This goes for total soluble salts as well as exchangeable sodium percentages of the top layer as shown in Subplot 20 C II .

On the other hand, one foot of water when it follows the application of gypsum at the rate of 2.4

T/H does reduce the high exchangeable sodium percentage to a marginal level in inly the first foot depth of soil as proven by Subplot 21 C II.

This indicates that the process has to continue for more time and that one foot of water is not sufficient to reclaim the Loma soils.

Therefore, while 1 or more feet of water show positive results in some spots, it does not make a rule for adjacent spots and when gypsum is applied, the differences are more in focus.

In PART III , which follows ,

Discussions of some FIELD PLOT treatments are listed.

5. Changes in gross intake rate for Leeching Experiments.

Generally gross intake rate of normal soils shows increase then followed by decrease while the soils which requiere reclamation treatments show only decrease en the intake rate. The faster the salt affected soils turn to alkaline, the greater the reduction in its intake rate shows up. Table No.33.

Plot No.11 shows how normal soil takes water, as the gross intake rate increases from 22.3 to 27.5 to 31.6 then drops back lo 16.6 mm/hours, upon the application of one, two, three and four feet depth of water to the soil surface, successively.

Plot No. 3 shows how salt affected soils show a sharp drop in its intake rate as its alkalinity content increases. Upon the application of four feet depth of water the results were 34.2 to 8.9 to 3. and 1.8 mm/hours successively.

PART II. FERTILIZER EXPERIMENTS.

Effect of five levels of nitrogen, six levels of phosphorus and 4 levels of potassium, separately and in combination were studied on combined crops (alfalfa and barley which were planted together). Nitrogen was added as ammonium sulphate while phosphorus was added as superphosphate and potassium as potassium sulphate. Also, time of nitrogen application in two or three times has been considered.

Potassium deficiency symptoms were obvious, possibly due to magnesium competition in the 30 - 70 cm layer. Some nutrient solutions also were tested by foliage spray to recover some iron induced chloroses.

Manganese, zinc and copper are shown also to be lacking.

The micronutrient deficiencies might be due to the unbalanced nutrients in the salt affected soils at the present stage. However, they should be investigated at lengh and watched for. At least a test plot programme should be initiated.

The experiments which were conducted in the Viedma Experimental Station were listed in Table No. 1 and the test plants were the combined crops of alfalfa and barley. In a positive sense these experiments prove that crop production can be elevated by the application of plant food elements and gave the following conclusions.

1. Nitrogen Response.

There is a good response to nitrogen (Fig.12).

1.1 Alfalfa.

It shows best average yield to nitrogen applied

(1.1 Alfalfa)

at 200 kg/hectare. The yield was 8.58 tons/hectare fresh weight.

1.2 Barley.

Barley shows a good response and gradual increase in yield with increase in nitrogen application.

The best average was 31.34 tons/hectare fresh weight when 300 kg nitrogen was applied.

The average response to the difference in application between 300 to 200 kg nitrogen was 13.92 tons/hectare fresh weight.

The maximum obtained yield was 34.66 tons/hecta. fresh weight due to the application of 300 kg/ton nitrogen.

1.3 Combined Crop of Barley and Alfalfa.

Best average in yield was 38.38 tons/hectare fresh weight corresponding to 300 kg/hectare nitrogen.

Maximun possible yield was 44.90 tons/hectare fresh weight to 300 kg/hectare nitrogen.

Sharp increase in both the average yields and maximun yield as the dose of nitrogen applied is increased.

All the above mentioned points are registered in Figure 12 , Nitrogen Results.

1.4 Average Nitrogen Results for the Whole Experimental Station.

Eighty replicates were distributed all over the Experimental Station in good, just reclaimed,and still under reclamation soils. The average of 8 replicates for the combined crop of alfalfa plus barley (in 1968) was 24.9 tons/hectare fresh weight when 300 kg/hectare nitrogen was applied. At the

rate of 100kg/hectare nitrogen applied, the yield was 18,6 and 2.6 tons/hectare fresh weight for 29 repetitions. Obviously, there is a gradual increase in the combined yield when the nitrogen dose increeses from 50, 100, 200 up to 300 kg/hectare nitrogen applied, Fig.13.

1.5 Nitrogen Split Application on Combined Crop of Alfalfa plus Barley (Fig.14).

A comparison between yield response to 50 and 100 kg/hectare nitrogen was made in a just reclaimed soil and planted for the first time.The nitrogen was applied at planting time, T_0; two months later, T_1 ; and three months later, T_2 . The results were interesting and show that:

When the nitrogen dose was higher, the yield was higher.

When nitrogen was added at one time, the best results when the time of application is at 2 months later for the small dose (50 kg/h) and at 3 months later for the high dose of 100 k/h.

Best time for split application is at 2 and 3 months old.

Maximum value obtained is when nitrogen is applied at one dose at three months old and the dose was high, 100 kg/h.

More conclusions can be obtained and this experiment is warrant further expansion to cover larger doses up to 300 kg/hectare nitrogen.

2. Phosphorus Response.

There is an increase in the average yield of alfalfa as the dose of phosphorus increeses from 0 up to 300 kg/P_2O_5/hectare (Fig.15). The

(2. Phosphorus)

yield was 8.7 t/h fresh weight when 300 kg/P_2O_5/h. was added.

The maximun possible results was 10.74 tons/hectare when only 100 kg P_2O_5/hectare was applied.Also thirty kg/hectare gave a yield of 10.33 tons/hectare fresh weight. However, there is a good response to P_2O_5 doses of 30, 100, 200 and 300 kg.

The average for barley shows a reductiom in yield when the plant received 30,100 and 200 kg/hectare P_2O_5. The maximun barley yield obtained when the plant received 300 kg P_2O_5/hectare was less than when the soil receives 0 phosphorus. In other words, there might be no response to phosphorus as far as barley goes.

The average of the combined crop of alfalfa plus barley gave 23.03 tons hectare when the soil receives 300 kg P_2O_5/h. While the yield for the combined crops when there is no phosphorus applied to the soil gave 21.7 tons/hectare fresh weight. To the doses of 30, 100, and 200 kg P_2O_5/h the yield was less than that obtained when the soil receives no phosphorus at all.

The maximum possible combined yield of alfalfa plus barley supports the same conclusion. The maximum possible yield was 27.66 tons/hectare fresh weight at 300 kg/hectare P_2O_5 in contrast to 29.15 tons/hectare fresh weight at 0 level of phosphorus.

The reduction in barley yield to increased doses of phosphorus from 30 to 200 kg/hectare is due to plant competition as the crops were planted together. It might be also due to some phosphate fixation and precipitation with calcium as some parts of these soils were just reclaimed.

3. Potassium Response.

No response to 50 kg/hectare K_2O when the plant receives 200 kg/hectare nitrogen and 60 kg/hectare phosphorus. Even 100 and 200 kg of potassium gave less yield

(3. Potassium Response)

than when only 30/kg/hectare of phosphorus were applied (Fig. 16).

It might also be due to excessive magnesium in the lower 30 - 70 cm layer.

4. Comparison of Fourteen Different Treatments of N - P - K for Alfalfa plus Barley (Fig.16).

The results of 14 different combinations with respect to the average yield of alfalfa was best obtained when 300 kg P_2O_5 was applied. Two hundred Kg of nitrogen alone gave second best results. Third best yield was obtained with 60 kg P_2O_5 and 200 K_2O was applied.

Best results obtaines for barley average was when 300 kg/hectare nitrogen was applied. The yield was 34.6 t/h fresh weight. This was followed by 200 kg/h nitrogen, as the yield was 26 t/h fresh weight, or 200 kg/h nitrogen and 60 kg P_2O_5 when the yield was 23.3 t/h fresh weight.

Best average yield for combined alfalfa and barley was obtained when 300 kg/h nitrogen was added. The yield was 38.4 t/h. Other good results was also obtained with 200 kg/h nitrogen and 60 kg/h P_2O_5 as the yield was 27.3 t/h fresh weight.

Next to this there was a possible yield of 29.2 t/h fresh weight of combined crop when the soil receives 300 kg/h nitrogen and 60 kg/h phosphorus. When only 200 kg/h nitrogen was added the combined yield was 26t/h.

Other conclusions can be drawn from Fig.16 and 17.

It is to state beyond doubt that these experiments which were conducted for the first time in this Zone have proven that plant food elements are needed to build up the soil fertility and increase the production of the land. There was a possible fresh yield up to 44.90 t/h fresh weight alfalfa and/or 34.66 t/h fresh weight barley, when 300 kg/h nitrogen were added as our experiment show.

(4. cont.)

Also, split application between planting time and 2 months later suits the area and gives better results when a small dose is added, then application is better at 3 months later. Best combination which suits the area is when phosphorus is applied at the rate of 100 kg/h alone or at the rate of 60 kg/h when supplied with 200 kg/h nitrogen.

Fertilizer experiments should be programmed and expanded to cover areas and field, following these potential results. The suggested fertilizer recommendations cited in Volume III , as well as the experiments designed and outlined for plant food elements should be a guide for further investigation and experiments. We should also bear in mind that neither potassium nor nitrogen fertilizer give their full effects without adequate supplies of the other.

5. Cultivation difficulties

This was taken up in the suggested Soil Management Appendix I, Volumen III. The problem of the soil was mainly due to salinity and soil surface cracks which was eliminated through leaching process and the recomendations listed in the tillage practice was adopted, as the results of some reclaimed soil was turned to Fertilizer Experiments (Nitrogen Split Application).

PART III . DISCUSSIONS OF SOME FIELD PLOT TRSATMENTS.

In this part individual discussion of the responses of some Field Plots and their particular reactions to the different treatments they receive in the field, are cited.

The Field Calendar of each Plot describes the kind of treatment it receives during this treatment

The changes that took place in the soils of these Plots are cited in Tables 43 - 66. And the dis - cussion of each individual Plot is mentioned here- after.

Discussions.

1. Plot 13

This plot is a saline alkaline one. Its results af- ter the addition of one foot of water has caused a reduction of something between 70 to 90% of its ori- ginal salts as shown in plot 13-A. Regarding the exchangeable sodium percentage, it can be said that it has been also reduced by a value that ranges between 46 to 57%.

After the application of another feet of water the total salt removed was between 80 and 90% and the ex- changeable sodium percentage has been reduced by 60 to 70 percentage.

The results between the first and second foot of wa- ter, which has been applied within one month apart, and the samples were 4 months apart (3/4/67 and 11/7/67), indicate that about 40% of the salt has been removed in the first 30 cm.layer but in the se- cond 30 cm.layer it has increased by 42% more and in the third layer it has been reduced by 26%.

Depending upon the total quantity of exchangeable sodium percentage the rate of reduction can be deter- mined. When the original values are high the reduc- tion percentage is low and vice versa (Subplot 13-B, y 13-C, results of 1st and second foot application of water.

After the addition of more water (4 feet) in a period of about 4 months, samples were taken after about 2 more months.

These conclusions can be stated.

The total soluble salts has been reduced by a total value of 93 to 96% in the upper 60 cm. layer and only by about 35% in the last 60-90 cm. layer. The exchangeable sodium percentage can be reduced by 80% and sometimes 86% its original value. Obviously the rate of reduction is higher in the upper layers and lower in the lower layers.

2. Plot 18

In salty soils about 80% of the salts has been removed by the application of one foot depth of water. And about 75% of the remaining salts were removed by the application of the second foot of water depth. And between 90 and 80% of the original salts can be removed down to a depth of 90 cm. after the washing with 2 feet of water (Plot 18-C).

The percentage of the salt removed can be up to 40% of its original quantity even when the soils are saline alkaline (Plot 18-C).

Thirty one per cent of the excheangeable sodium percentage can be removed by the application of one feet depth of water and at the depth of 60-90 cm layer. Upon the application of another foot of water this percentage can reach 50% of the original quantity.

Application of gypsum even as low as 2 tons/hectare followed by 4 feet of water, reduces the original quantity of salts which has been between 8 and 15 mmhos/cm, down to 0.5 to .7 mmhos/cm. In other words, to 4%. The original salt quantity was left and 96% was removed throughout the depth of 0-90 cm in the soil. The same treatment reduced the exchangeable sodium percentage from between 8 and 29 down to between 7 and 13; that is to say, between 75 and 25 % of the original value was removed successively throughout the depth form 0 to 90 cm and only 25% was left dn the upper first 30 cm layer, and between 30 and 25% was removed from the original value successively in the layers 30-60 cm and 60-90 cm.

The ammount of salt or exchangeable sodium percentage removed from the soil is always small when the original salt content is a small quantity (less than 4 mmhos/cm for the total salts and less than 15% exchangeable sodium). The total salt content can be only reduced by 23% in the upper layers and 75% in the lower layers. And the exchangeable sodium percentage can be reduced by 16% in the upper layers and this quantity can be increased up to 46% re - moved in the lower layers.

3. Plot 19

It follows the same pattern as Plot 18, with these main features:

Sometimes the salt can increase above its original value by the ammount of 200% between the time one foot and the 2nd foot of water are applied (2months) and it can increase up to 170% upon the usage of gypsum even when the latter was followed by 3 feet of water; this is when the original salt content is below 5 mmhos/cm and the quantity of gypsum is in the vicinity of 7 tons/hectare. This increase in salt is throughout the entire profile down to a depth of 90 cm.

The exchangeable sodium percentage can increase when it is at a low level, below 15% by the application of one foot of water alone by 66% its original value in the 2nd 30 cm layer. This condition can be offset by the applications of water, one foot each time. Under these conditions the exchangeable sodium can be reduced by 96% its original value at the top layer (0-30 cm) and by about 50% in the 60-90 cm layer.

Finally, also, salts may increase as well as the exchangeable sodium percentage, especially in the third lower layer 60-90 cm when the process of reclamation stops for about 4 months and starts again when the soils are saturated. This increase can be by 14% or 15% more than the original value(19-0, 60-90 cm layer). The excheangeable sodium can report 25% or 20% more the value found in the soil before the 4 months (before the gypsum and the water application) even if the gypsum quantity is as little as 2 tons/hectere.

When soils are good saline alkaline having total soluble salts over 15 mmhos/cm and exchangeable sodium percentage over 30 throughout the profile, the applications of one foot of water may increase the total salt content in the upper 30 cm layer by about 25%, and only reduce the middle layer by about 9% , and the third layer (60-90 cm) by about 16% of the

total salts. The reduction in the second layer can account for the increase in the upper layer. In the exchangeable sodium percentage an increase by about 25% over the original value is expected.

Application of gypsum at the rate of 3600 lb/hectare, followed by two applications of water, one foot depth each and one month apart, can cause the total salts in the upper and middle layers (10-30 and 30-60 cm layers) to be reduced by about 60% instead of its increased value due to previous water treatment. The same treatment can also reduce the exchangeable sodium content from 40% throughout the depth of 0-90 cm to 30 and 50%. This case is clearly demonstrated by data of the 25 A Subplot.

When soils are low in total salts content but have a tendency to be alkaline, the application of one foot of water will make the entire depth of soil alkali and increase the value of exchangeable sodium percentage up to 130% its original value. This increase in the exchangeable sodium is on the account of the reduction of the total soluble salts (Subplot 25 B).

However, upon the application of gypsum by the value of 2-4 tons/hectare followed by 2 feet of water, the salts were reduced by up to 60% and the exchangeable sodium is reduced by almost 90% and 80%. And the soil is completely recovered in both total salts, as well as echangeable sodium percentage. The tendency to alkalinity is being sufficiently offset.

This picture is reported, but at a lower degree, for the Subplot 25 C.

4. Plot 26

Saline alkaline soil shows that total soluble salts can decrease by the application of one foot of water while sodium percentage can increase on the clay complex as a result of the same treatment. While salts were reduced by over 80% or 40% in the layers 0-30 or 30-60 cm, it has been increased in the lower 60-90 cm layer by 7%. The exchangeable sodium complex has been increased by 67%more than its original value and while being reduced in the middle layer, it has been increased in the lower layer by about 75%. The application of gypsum followed by only one foot of water caused the total salts to show fyrther reduction up to 50% more than the already reported data before treatment, and the clay complex showed about 30% reduction in the upper layer only; the gypsum caused accumulation of the exchangeable sodium to take place in the 2nd.layer (60-90 cm). The exchangeable sodium has been increased by 65% over its original value.

This will conclude that one foot of water following gypsum treatment is not sufficient to accomplish the desired reduction in exchangeable sodium percentage, (Plot 26 A).

At a lower degree of salt content as well as exchangeable sodium percentage, this same treatment can lead to better results the lesser the gypsum quantity be.

When gypsum was 3600 tons/hectare, the slightly saline alkaline soils showed reduction of the original salts by about 93% of the original reported value and the exchangeable sodium was reduced by about 23% in the lower layer of 60-90 cm. This case is well demonss - trated by Subplot 26 B.

Further better results were obtained with soils of slightly better conditions, as Subplot 26 C, when even less quantity of gypsum was applied.

The salts were higher, in this case, in the lower layer (60-90 cm) alone. One foot of water applied following the gypsum treatment of 1800 tons/hectare

showed a reduction of about 91 % in the total soluble salts in the last layer (60-90 cm) and a reduction of 73 % of the exchangeable sodium percentage in the same layer.

5. Plot 27

The most important conclusion to be reported here is the fact that although the gypsum quantity is less than the quantity reported for similar soils, it gave better results when followed by 4 feet of water applied successively in 4 times, one foot each time.

Subplot 27 B which shows up to 30 mmhos/cm in total salt quantity and up to 23 exchangeable sodium percentage on the clay complex, has been a good example of this case. Its total salt content was reduced by a value up to 96% The value reported before the application of gypsum and its exchangeable sodium percentage was reduced from 40% to 10%, indicating a percentage of 75% reduction. This fact was accomplished only by .562 Tons/hectare of gypsum.

6. Plot 28.

Strongly saline alkaline soils with one foot of water, although they can show reduction in total soluble salts, the exchangeable sodium percentage can be greatly increased, yet. Values of 28 B showed an increase in the exchabgeable sodium by 122% in the upper layer.

After gypsum application at the rate of o.75 tons/ hectare and then 3 feet of water applied successively in three times, the total salts showed a total reduction by about 90% and the exchangeable sodium by about 65 or 45%. However, the rate of reduction was less than the value reported by a lesser gypsum quantity and one foot of water added, as is the case of Subplot 27 B, when compared with Subplot 28 B.

7. Plot 29.

Soils of high salinity and high alkalinity can respond at a different degree upon the application of water alone or when water is applied before gypsum or after gypsum application.

When the total soluble salts are small but more than 8 mmhos/cm when measured by electrical conductivity, up to 80- 90% salts can be removed. At 16 mmhos/cm electrical conductivity but with high sodium exchamgeable capacity (40%) only less than 30% of the total salts can be removed; and sometimes this value can only be 10%, or less as is the case of Subplot 29 A or 29 B. In this case the lower layer (60-90 cm) will not yield any salts. And this case is more strong when the exchangeable sodium percentage is taken into account, as almost after the first 30 cm depth there cannot be any change to be noticed and even some increase is expected to be reported as Subplot 29 C.

After the application of gypsum at the rate of 937.5 kg/hectare followed by 2 feet depth of water,applied one foot successively in two times, the picture is very much encouraged toward the better conditions. The total salts are reduced by 80% from the original in the first 30 cm layer 50% in the second 30 cm layer, and by about 20% in the third 30 cm layer deep successively. The exchangeable sodium percentage can be reduced by about 40% from its original value in general throughout the entire depth of 90 cm, with above the average salts removed from the upper layer of the soil and less than the average being removed from the lower layers.

Upon fractioning the process of reclamation and for knowing the effect of gypsum alone when followed by 2 feet depth of water applied to the soil 2 months and a half apart form each other, the total salt content can be reduced: only by 50% on the surface layer,about 30% in the middle layer and by about 14 % in the lower layer.

These results were more to the better when the total exchangeable sodium percentage is taken into consideration. The surface layers can show a reduction of 12% and the middle 30 cm layers can show up to 50% reduction of exchangeable sodium percentage and finally the last 30 cm layer can be reduced by about 30 %.

8. Plot 30.

Plot 30 represents saline alkaline soils where the alkalinity is higher than the salinity. Both Subplot 30 A and 30 C have the same total soluble salts quantity which ranges between almost 10 and 20. And the only variability is the exchangeable sodium percentage. Subplot 30 A has the exchangeable sodium percentage between 30 and 40, while in Subplot 30 C the exchangeable sodium percentage is between 20 and 30.

Upon the application of one foot of water, the total soluble salts in Subplot 30 A have been decreased by 80, 40 and 33 % successively for the three depths 0-30, 30-60 and 60-90 cm. and the corresponding exchangeable percentage has been decreased by 52, 32 and 0% for the corresponding layers. The average decrease of salts throughout the depth is 51% (for the three layers form 0-90 cm) and the corresponding average decrease of the exchangeable sodium percentage is 28. Subplot 30 C, which has less exchangeable sodium percentage, showed an average decrease throughout the depth of 0-90 cm in the total soluble salts by 90% and the soluble exchangeable percentage by 41%. In other words, about 12% difference in exchangeable sodium percentage originally present in the soil (37-25%) can cause a difference in progress of reclamation in the total soluble salts by about 40% more and in the exchangeable sodium percentage by about 13% more upon the applications of one foot of water; the lower quantity of the exchangeable sodium percentage is the progressive one, Subplot 30 C.

When soils have total soluble salts between 20 and 30 mmhos/cm and the exchangeable sodium percentage is over 40%, the application of one foot of water can cause increase in the salt content throughout the entire profile down to a depth of 90 cm by about 25% more. The exchangeable sodium percentage cannot show any reduction after 30 cm from the surface.

When the soil receives a small quantity of gypsum at the rate of 0.9 ton/hectare, and is followed by only

one foot of water, the first effect will be an in - crease in the total quantity of salts to be removed. Instead of the increase in salt content reported before by about 25%, there is now a reduction by about 70% in the surface's 30 cm layer and another reduction of about 21% in the second 30 cm layer. Regarding the exchangeable sodium percenteges the reduction was 40% in the surface layer and 7% in the second 30 cm layer

Registering only the effect of the 0,9 tons/hectare gypsum, the total soluble salts have been reduced very much in the first 30 cm layer, 76% and 36 % in the second 30 cm layer, and 11% in the last 30 cm layer. The exchangeable sodium percentages have been increased by a small percentage in the second 30 cm layer. In the third 30 cm layer nothing took place. This can indicate the small quantity (one foot) of water applied following the gypsum treat - ment and reduce the total soluble salts at a much higher level than it did for the exchangeable sodium picture in the soil. More water should be applied.

9. Plot 31.

This plot present a very important conclusion which is as follows.

Soils with total soluble salts whose electrical conductivity is less than 10 mmhos/cm throughout a depth of 90 cm (and whose exchangeable sodium percentage is in the vicinity of 15% in the middle layer of 30-60 cm depth, and even up to 30% in the lower layer (69-90 cm), upon the application of one foot of water up to 90% of the salts can be removed and about 50% of the exchangeable sodium percentage can be removed by the same treatment (Subplot 31 A).

Soils which have total soluble salts to reach between 15-30 mmhos/cm and its exchangeable sodium percentage is also over 15 (being between 17 and 34%), can also react very favourably to the application of one foot of water.
Over 95% of the total soluble salts was removed throughout the total depth of 0-90 cm, and the exchangeable sodium percentage was reduced to a considerable extent throughout the depth. The lower layer (60-90 cm) has been reduced by about 50% from 34 to 17%, Subplot 31 C.

Although the total soluble salts were not as high in Subplot 31 B as in Subplot 31 C, yet due to the extreme quantity of exchangeable sodium percentage, -between 30-40% throughout the profile-, only about the first 60 cm depth showed favourable reduction in the salts removed. Sixty six and 38% salts were removed successively in the first 30 cm layer and in the second 30 cm layer. The exchangeable sodium percentage has been reduced by about 30% in the upper 30 cm layer and no change took place underneath.

Due to the high status of exchangeable sodium in 31 B, the application of 3 successive feet of wa-

ter after a three months period shows that the salts have been increased during these three months period of abandoning the soil such that the application of 3 feet of water did not remove from the soil what one foot did, before the soil was abandonned. The percentage of salts removed was 46 on the top, followed by only 5% in the second layer, and even the last 30 cm layer still showed an increase of about 18 from the original conditions on 13/4/67.

To put it into a different form, the effect of the initial reclamation accomplished by one foot water applied has been offset by leaving the soils a period of 3 months and we have lost the effort of 3 feet of water it takes to apply it, which is another 5 months (from 11/8/67 to 22/3/68). If we look into the exchangeable sodium percentage picture one can conclude that it has gone far worse. The new exchangeable sodium percentage on 22/3/68 is more than what it was on 13/4/68 (a year later) as it has been increased by 7% more in the upper 30 cm layer and 5% more in the third 30 cm layer.

When we want to study the difference between the results after the first leaching with one foot of water (on 11/8/67) and the results of the new treatment (on 22/3/68) of 3 feet water applied successively in ablout 5 months period, and after 3 months from the application of the first foot of water, it is interesting to note the following.

The total soluble salts have been increased by 63% in the first 30 cm layer, more than the results achieved by the application of one foot of water; and 54% more in the second layer, and 30% more in the third layer.

Not only this, but also the exchangeable sodium percentage has also been increased by 55% in the upper 30 cm layer and 5% in the last 30 cm layer.

From this we can conclude, mainly, that abandoning the soil even for a period of 3 months after the process of reclamation starts, or putting the soil under cultivation, can do more harm to the soil than before as salts can be increased by a percentage up to 65% and exchangeable sodium percentage can also be increased by about 55%.

10. Plot 32.

Saline soils such as Subplot 32A where the lower layer (60-90 cm) has salt over 16 mmhos/cm and with exchangeable sodium percentage about 17, and where the salts in the upper 60 cm layer even over 12 mmhos/cm and the first upper layer is not good for sensitive plants , one foot of water applied has proven good to bring the soil into the good status throughout the depth of 90 cm layers. Almost over 90% of the salts can be removed and about 60% reduction in the exchangeable sodium percentage can be achieved.

One foot of water is not sufficient for saline alkaline soils, as Subplot 32 C. Total soluble salts show reaction between 11 and 21 mmhos/cm and the exchangeable sodium percentage ranges between 20 and 29, and upon the application of one foot of water the upper and the medium layers were recovered from salts, while the third layer was not. When the exchangeable sodium percentage is considered, almost the first 30 cm can be considered as recovered, but not the second ot third layer as the amount left is still limiting.

At that stage the addition of gypsum is very much advisible. The addition of water to the saline alkaline soils with very high exchangeable sodium per - centage can only affect the salinitu status of the soil and cause some gradual reduction from the sur - face top layer going down. However, there cannot be expected any reduction in the exchangeable sodium percentage.

In this case, if more water has to be added, as is the case in Subplot 32 B, the added water will not cause additional reduction in the salts more than what has been accomplished with one foot; only as a matter of fact, some increase may be encountered in the lower layer over what is known to exist there.

Inspection of the alkalinity will indicate its spread beyond the original limits. For example, the original exchangeable sodium percentage was 17 in the first

30 cm layer and over 40 in the successive 60 cm layers. After adding 2 feet of water the alkalinity was still very limiting in the lower 2 layers and extended to show increase in the upper 30 cm layer by about 24% more.

When the effect of the new treatment has to be considered alone, and to be checked with the results obtained from one foot of water, it must be said that the salts have been increased throughout the profile up to about 45%, and have risen up from the lower layers to cover the upper one. The same picture can also be found with the exchangeable sodium percentage.

11. Plot 33.

Soils which are salty in the lower depths only 30 - 60 cm and 60 - 90 cm at a limiting range can be changed to very salty soils upon the application of one foot of water when the exchangeable sodium percentages are less than 15. About 80 to 90 % of the salts can be removed throughout the 90 cm depth. And the exchangeable sodium percentage can be reduced to a very favourable level. Up to 60 of the exchangeable sodium can be removed. This is clear from Suplot 33 A and 33 C.

Depending upon the degree of alkalinity presented, the percent salt removed can be determined by its application of one foot of water.

High alcalinity will make one foot of water and does not affect the total soluble salt as much as the percentage removed can be only reduced down to 20 as is the case in Subplot 33 B, lower layer. Regarding the exchangeable sodium percentage there cannot be expected any reduction (33 B).

When these soils have been left for about 7 months and irrigated again with one foot water, there has been an increase in the upper 30 c, layer of about 40% .

The exchangeable sodium percentage did not show any reduction in the upper 30 cm and did not change from where it was before the addition of the new feet of water.

Small doses of gypsum are recommended in this case.

T H A N K S

TO THE WORKING STAFF

The FAO Fertility Scientist is acknowledging the tremendous effort and collaboration of the Laboratory staff who worked under his supervision for two and a half years and made all the analyses for all the studies covered in this Final Report.

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END
1969

M. K. Radwan

Dr. M. K. Radwan
FAO, Soil Fertility Scientist
May 1969

TABLE N° 1

LIST OF THE 19 EXPERIMENTS WHICH ARE CONDUCTED IN THE VIEDMA EXPERIMENTAL STATION.

Ref. Volume III, Part V, Thirty Experiments to solve the Major soil Fertility Problems in the Project Area.

Exp. N°	
Exp.	1 Reclamation Field, Blocks Nos. 1, 2 and 3.
Exp.	2 Reclamation Field, Block No. 4.
Exp.	3 Reclamation Field, Blocks Nos. 2 and 3.
Exp.	4 Experimental Station, Block No. 20.
Exp.	5 Lysimeter cases of Experimental Station.
Exp.	7 Reclamation Field, Block No. 4.
Exp.	8 Reclamation Field, Blocks Nos. 1, 2 and 3.
Exp.	9 Experimental Station, Block No. 2 D.
Exp.	12 Experimental Station, Block No. 2 D.
Exp.	13 Experimental Station, Block No. 2 D.
Exp.	18 Reclamation Field, Blocks Nos. 1 and 2 (in the reclaimed Plots Fert. with Barley).
Exp.	19 Experimental Station, Block No. 2 E (Barley) On Loma Soils.
Exp.	19 Experimental Station, Block No. 2 E (Alfalfa) On Loma Soils.
Exp.	19 Experimental Station, Block No. C (Series 02.1) (Barley)
Exp.	20 Fertilizer Field, Block No. C (Series 02.1)(Barley)
Exp.	21 Fertilizer Field, Block No. C (Series 02.1)(Barley)
Exp.	19 Fertilizer Field, Block No. C (Series 02.1)(Alfalfa)
Exp.	20 Fertilizer Field, Block No. C (Series 02.1)(Alfalfa)
Exp.	21 Fertilizer Field, Block No. C (Series 02.1)(Alfalfa)

19 Total No. of Experiments.

TABLE NO. 2 A

CHANGE IN SOIL PROPERTIES UNDER RECLAMATION IN

PROJECT AREA (Lys. Exp.)

Ser. 01.1

Prof. 6 2143

	DEPTH IN cm	SAT. %	pH	CAL-CAL.	ORG. MAT.	N%	TEXT.	(mcq./100 gm soil) EXCHANGEABLE - CATION - PERCENTAGES SUM	Ca^{++}	Mg^{++}	K^{+}	Na^{+}	TOTAL	GYPS.	P_2O_5 P.P.M.
Before Leaching	0-30	70.0		0.3	3.1	1.2	FL	34.5	21.0	11.2	1.4	0.9	36.0	7.2	266.0
1st, Leach		51.0	7.3		2.6			32.6	24.6	5.6	1.7	0.7	31.6	6.0	277.2
Before Leaching	30-60	54.0		2.2	1.9	0.6	FL	35.1	18.6	13.8	0.9	1.7	34.0	9.6	107.8
1st. Leach.		56.0	7.9	3.3	1.2			32.8	21.3	9.0	1.1	1.5	32.0	4.8	93.8
Before Leaching	60-90	55.0		11.1	0.9	0.6	FAL	35.4	17.8	12.4	0.9	4.5	32.8	8.8	44.8
1st. Leach.		50.0	8.1	0.0	0.8			28.8	16.3	4.4	0.8	2.3	28.4	2.4	44.8

TABLE NO. 2 B

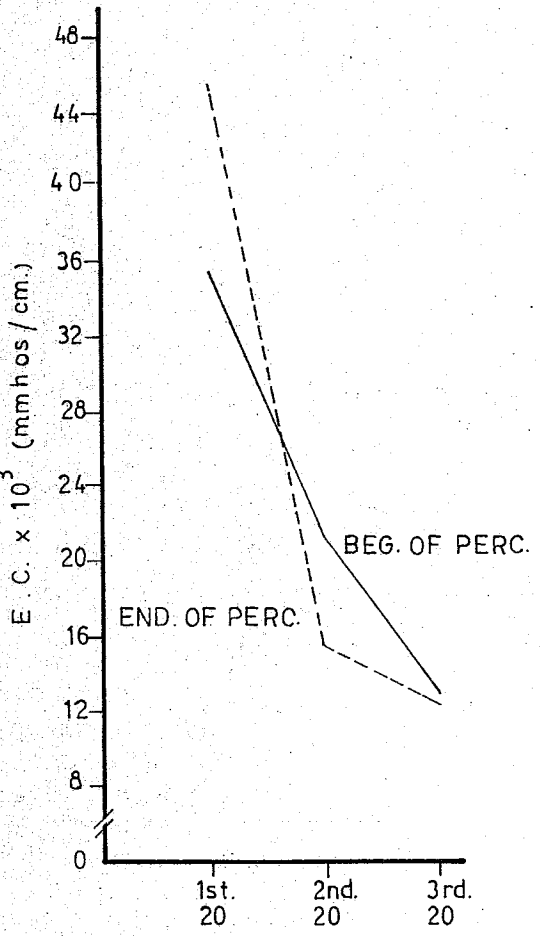
CHANGE IN SOIL PROPERTIES UNDER RECLAMATION IN PROJECT AREA

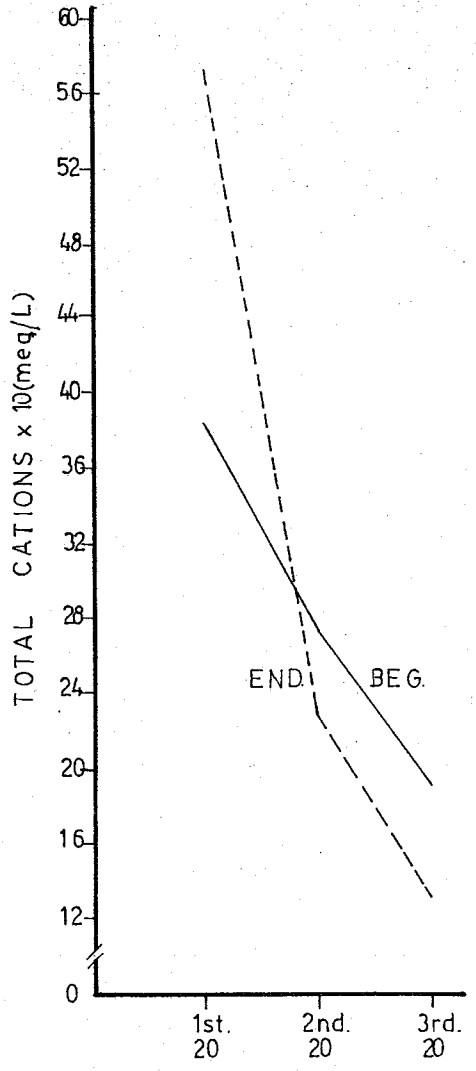
(SATURATION EXTRACT DETERMINATIONS)(Lys. Exp.)

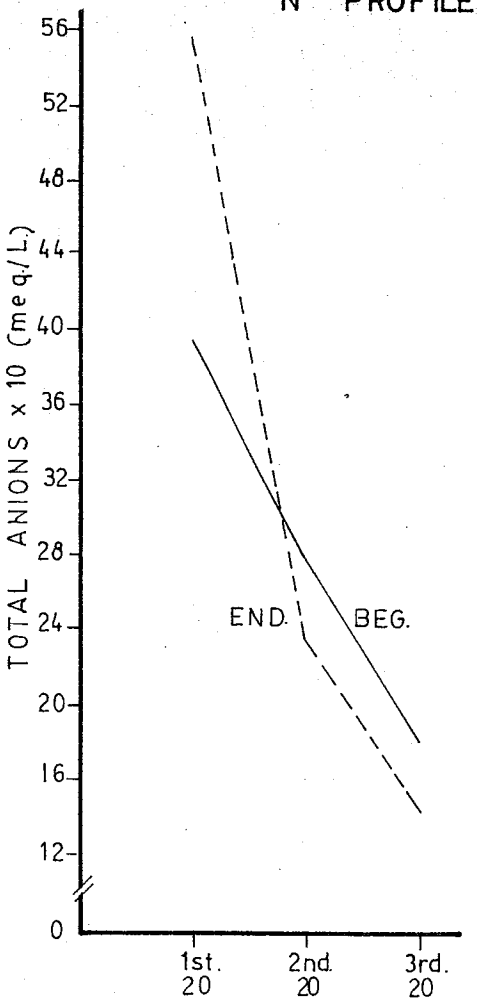
Ser. 01.1
Prof. 6 2143

	DEPTH IN cm	E C x10^3 mmhos/cm	(meq./liter) Ca^{++}	Mg^{++}	K^+	Na^+	TOTAL Cations	Cl^-	SO_4^{--}	CO_3^{--}	HCO_3^-	TOTAL Anions
Before Leaching	0-30	0.8	1.8	1.7	0.2	4.8	8.3	3.0	2.0	0.0	3.0	8.0
1st.Leach.		1.2	7.5	3.5		2.8	13.8	2.4	6.7	0.0	4.5	13.6
Before Leaching	30-60	2.9	5.3	7.4	0.2	21.6	34.5	3.0	27.5	0.0	3.3	33.8
1st.Leach.		1.1	2.9	2.0		4.9	9.9	1.5	6.4	0.0	2.1	10.0
Before Leaching	60-90	0.6	1.1	0.7	0.1	5.0	6.9	1.2	1.6	0.0	4.0	6.8
1st.Leach.		1.9	3.4	3.2		10.0	16.6	2.5	12.3	0.0	1.5	16.3

N° SERIE : 01.1
N° PROFILE : 2143







TREATMENT = RECEIVED A TOTAL OF 4 TONES OF GYPSUM / HECT. IN 2 PORTIONS.

CHANGES IN ELECTRICAL CONDUCTIVITY, TOTAL CATIONS AND TOTAL ANIONS MEASURED AT BEGINNING AND END, IN PERCOLATED WATER.

(LYS. EXP.)

TABLE No. 3

CHANGE IN CHEMICAL COMPOSITION OF PERCOLATING WATER DURING DIFFERENT RECLAMATION TREATMENTS (Lys. Exp.)

Ser. 01.1
Prof. 2143

Treatments	Sampling Time[1]	pH	E C x10^3 mmhos/cm at 25°c	(meq./Liter) Ca^{++}	Mg^{++}	K^+	Na^+	TOTAL Cations	Cl^-	SO_4^{--}	CO_3^{--}	HCO_3^-	TOTAL Anions
First	A		35.6	90.0	88.0	1.8	204.0	383.8	328.0	62.0	0.0	5.0	395.0
	B		45.0	134.0	148.0	1.0	288.0	571.0	460.0	93.0	0.0	5.0	558.0
Second	A	7.9	21.2	45.2	41.2		18.4	270.4	143.0	135.0	0.0	1.7	279.4
	B	7.3	15.7	26.4	39.4		159.0	224.8	62.5	162.5	0.0	1.90	236.9
Third	A		13.2	26.3	32.6		132.0	190.9	42.0	135.0	0.0	1.8	180.8
	B		12.8	17.6	25.6		92.0	135.2	17.0	123.0	0.0	2.3	142.3
Fourth	A												
	B												

First treat.(gyps.= 200 gm/m2 and water 20 cm), Second treat.(gyps.= 200 gm/m2 and water 20 cm), Third treat.(gyps.= 0 gm/2 and water 20 cm), plowing and levelling followed the application of gypsum in each time.

1 - Leachate samples are taken at "A" begining and "B" end of each percolating time.

TABLE NO. 4 A

CHANGE IN SOIL PROPERTIES UNDER RECLAMATION IN PROJECT AREA (Lys. Exp.)

Ser. 02.1
Prof. 2 97

	DEPTH IN cm	SAT. %	pH	CAL-CAR.	ORG. MAT.	N %	TEXT.	(meq./100 gm soil) EXCHANGEABLE SUM	-CATION - PERCENTAGES Ca^{++}	Mg^{++}	K^{+}	Na^{+}	TOTAL	GYP.	P_2O_5 P.P.M.
Before Leaching	0-30	75.0	8.1	2.7	4.4	1.9	FAL	49.4	32.0	9.4	2.5	5.5	48.8	16.8	380.0
1st.Leach.		58.0		0.8	2.6	1.4	FAL	47.1	26.4	10.4	2.3	8.0	47.6	13.6	454.0
2nd.Leach.		58.0		2.4	3.9			46.1	33.0	8.4	1.3	3.4	43.2	4.8	310.8
Before Leaching	30-60	96.0	8.2	1.7	2.1	1.2	FAL	52.0	29.8	11.6	2.1	8.5	50.4	13.6	496.0
1st.Leach.		75.0		0.9	2.5	1.3	FAL	44.2	25.6	12.6	1.9	4.1	47.8	16.8	442.0
2nd.Leach.		74.0		0.8	2.0			54.1	30.4	15.2	1.7	6.8	54.0	1.2	420.0
Before Leaching	60-90	100.0	8.6	2.8	1.8	1.1	FL	61.2	25.2	17.6	1.0	17.2	62.4	22.4	372.0
1st.Leach.		80.0		0.9	1.9	1.0	FAL	57.6	28.2	13.2	1.9	14.4	52.2		406.0
2nd.Leach.		77.0		0.8	1.7			53.3	29.0	14.2	1.7	11.4	50.4	0.8	364.0

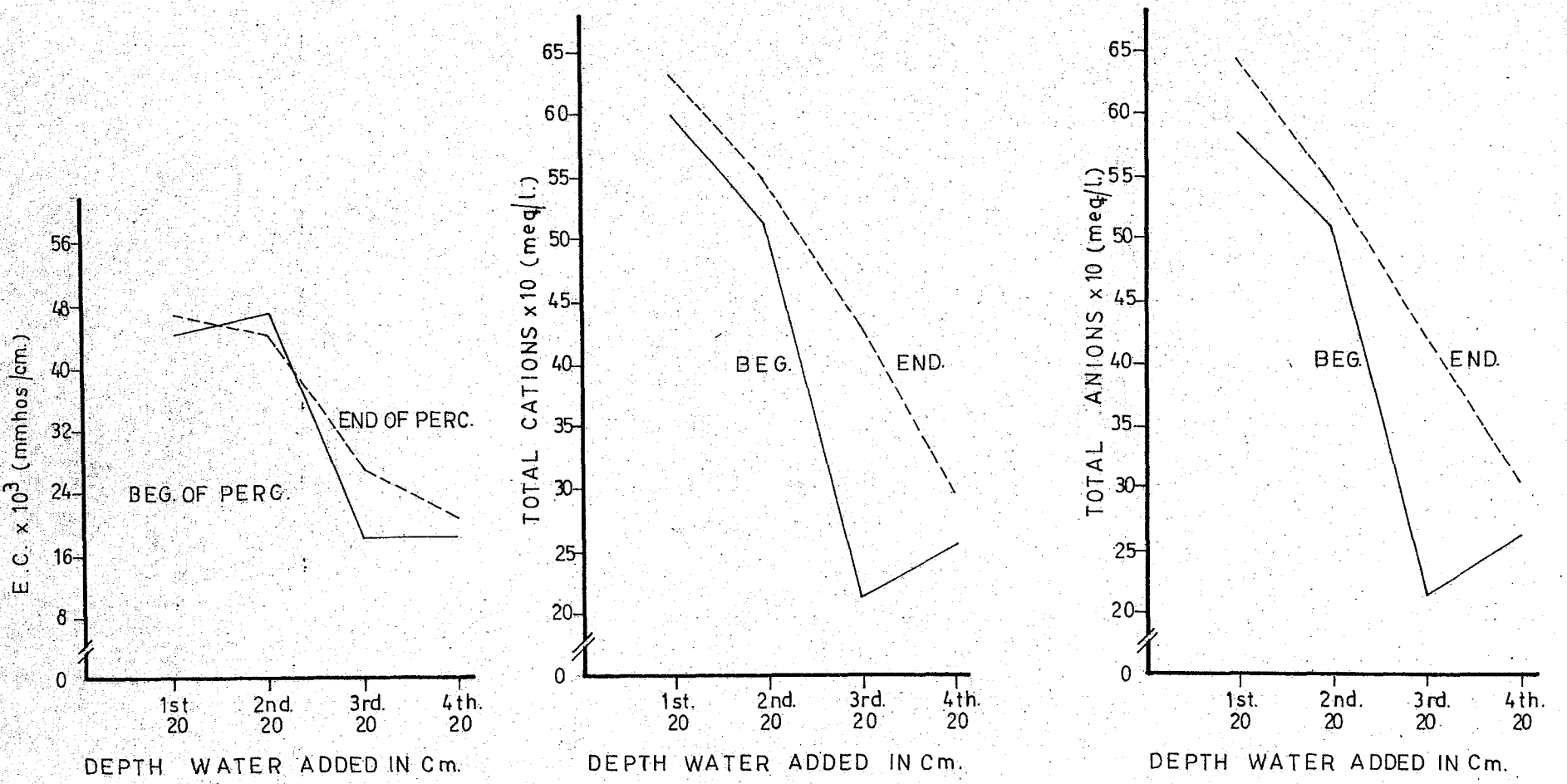
TABLE NO. 4 3

CHANGES IN SOIL PROPERTIES UNDER ACCUMULATION IN PROJECT AREA
(SATURATION EXTRACT DETERMINATIONS)(Lys. Exp.)

Ser. 02.1
Prof. 2 97

	DEPTH IN cm	E C x10^3 mhos/cm	(meq./Liter)									
			Ca^{++}	Mg^{++}	K^+	Na^+	TOTAL Cations	Cl^-	SO_4^{--}	CO_3^{--}	HCO_3^-	TOTAL Anions
Before Leaching	0-30	1.4	2.3	1.6	0.2	14.1	18.2	3.0	6.5	0.0	9.0	18.5
1st.Leach.		1.4	2.2	1.9		11.4	15.5	1.3	8.2	0.0	6.3	15.8
2nd.Leach.		1.4	4.4	1.3		10.3	15.9	2.0	9.3	0.0	4.8	16.0
Before Leaching	30-60	7.2	18.4	14.2	0.6	60.8	94.0	2.3	85.0	0.0	4.3	91.6
1st.Leach.		4.2	11.6	8.3		27.2	47.1	2.0	40.5	0.0	4.5	47.0
2nd.Leach.		2.3	1.6	3.3		18.8	23.2	2.4	18.2	0.0	3.0	23.6
Before Leaching	60-90	15.1	2.4	25.5	0.9	134.0	184.3	60.0	125.0	0.0	7.5	192.5
1st.Leach.		9.2	19.7	17.1		90.4	127.2	20.0	95.0	0.0	6.3	121.2
2nd.Leach.		6.2	5.6	10.8		60.8	73.2	2.0	70.0	0.0	2.0	74.0

N° SERIE : 02.1
N° PROFILE : 97



TREATMENT= RECEIVED A TOTAL OF 8 TONES OF GYPSUM/HECT. IN 4 PORTIONS.

CHANGES IN ELECTRICAL CONDUCTIVITY , TOTAL CATIONS AND TOTAL ANIONS MEASURED AT BEGINNING AND END , IN PERCOLATED WATER.
(LYS. EXP.)

TABLE NO. 5

CHANGE IN CHEMICAL COMPOSITION OF PERCOLATING WATER DURING DIFFERENT RECLAMATION TREATMENTS (Lys. Exp.)

Ser. 02.1
Prof. 97

Treatments	Sample[1] time	pH	E C x10^3 mmhos/cm at 25°c	(meq./liter)									
				Ca^{++}	Mg^{++}	K^+	Na^+	Total Cations	Cl^-	SO_4^{--}	CO_3^{--}	HCO_3^-	Total Anions
First	A	8.2	43.7	72.0	96.0	3.0	432.0	603.0	441.0	130.0	0.0	10.0	581.0
	B		46.2	58.0	98.0	2.4	472.0	630.0	489.0	145.0	0.0	8.0	644.0
Second	A		46.7	64.0	70.0	2.0	376.0	512.0	393.0	107.0	0.0	5.0	505.0
	B		44.0	53.0	89.0	2.0	408.0	548.0	357.0	180.0	0.0	5.0	542.0
Third	A	7.3	18.6	25.4	6.0		184.0	210.0	113.0	100.0	0.0	4.0	213.1
	B	7.4	26.8	52.0	35.0		340.0	427.0	128.0	285.0	0.0	1.70	414.7
Fourth	A		18.7	24.0	21.2		216.0	256.8	42.0	220.0		1.2	263.2
	B		20.8	42.0	17.0		238.0	297.0	43.0	260.0		1.3	304.3

First treat.(gypo.= 200 gm/m2 and water 20 cm),Second treat.(gypo.= 200 gm/m2 and water 20 cm), Third treat.(gypo.= 200 gm/m2 and water 20 cm),Fourth treat.(gypo.= 200 gm/m2 and water 20 cm), plowing and levelling followed the application of gypsum in each time.

1 - Leachate samples are taken at "A" beginning and "B" end of each percolating time.

TABLE NO. 6 A

CHANGES IN SOIL PROPERTIES UNDER RECLAMATION IN PROJECT AREA (Lys. Exp.)

Ser. 02.1
Prof. 3 369

	DEPTH IN cm	SAT. %	pH	CAL-CAR.	ORG. MAT.	N %	TEXT.	(meq./100 gm soil) EXCHANGEABLE - CATION - PERCENTAGES SUM	Ca^{++}	Mg^{++}	K^{+}	Na^{+}	TOTAL	GYPS.	P_2O_5 P.P.M.
Before Leaching	0-30	70.0	7.4	0.6	3.6	1.3	FAL	40.5	36.0	2.6	0.9	1.0	38.6	16.0	280.0
1st.Leach.		56.0		0.4	3.1	0.8	FAL	38.8	28.2	7.8	1.0	1.8	44.0	22.4	330.0
2nd.Leach.		58.0			3.1			44.3	32.6	8.8	1.7	1.2	43.2	4.8	231.0
Before Leaching	30-60	77.0	8.0	1.9	2.1	1.1	FAL	44.7	31.0	11.6	0.5	1.6	44.8	16.0	311.0
1st.Leach.		59.0		0.7	1.6	2.3	FAL	43.1	28.8	10.4	1.2	2.8	42.4	8.8	312.0
2nd.Leach.		60.0			2.1			46.4	30.0	12.6	1.8	2.0	45.6	6.0	260.4
Before Leaching	60-90	72.0	8.2	4.2	1.6	0.7	FL		47.2	20.9	0.2	2.1	54.8	3.2	616.0
1st.Leach.		55.0		2.4	0.2	0.8	FL	38.8	32.2	3.0	0.4	3.2	37.6		616.0
2nd.Leach.		52.0			0.9			40.5	31.0	6.4	1.4	1.7	40.0	15.6	462.0

TABLE NO. 3 B

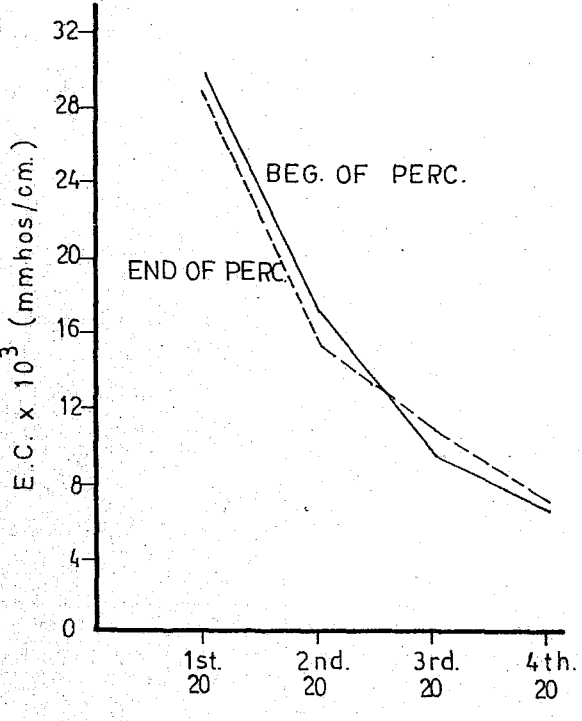
CHANGE IN SOIL PROPERTIES UNDER RECLAMATION IN PROJECT AREA

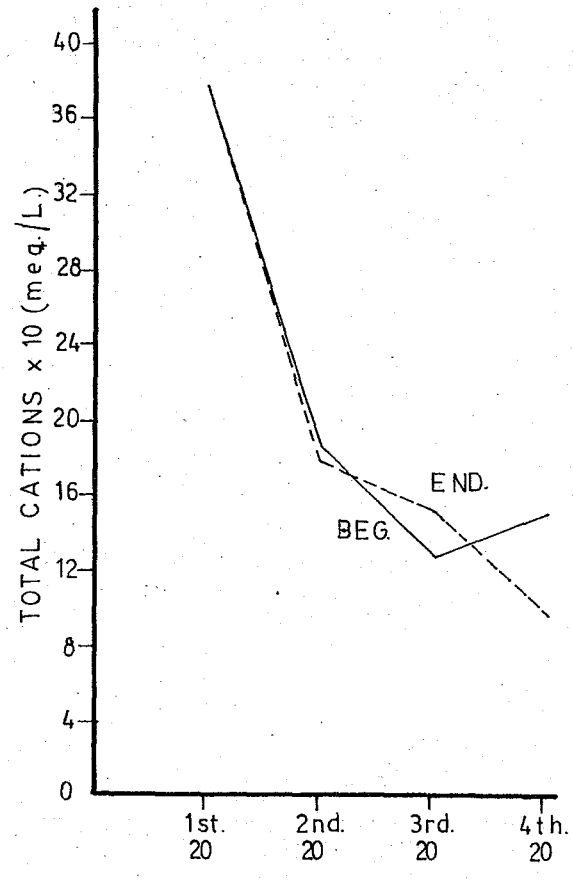
(SATURATION EXTRACT DETERMINATIONS)(Lys. Exp.)

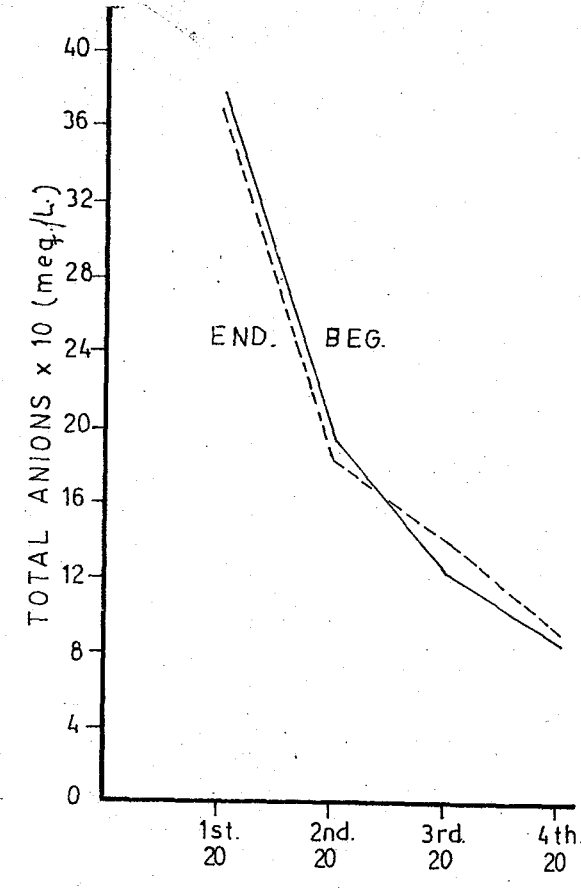
Ser. 02.1
Prof. 3 369

	DEPTH IN cm	E C x10^3 mmhos/cm	(meq./Liter) Ca^{++}	Mg^{++}	K^+	Na^+	TOTAL Cations	Cl^-	SO_4^{--}	CO_3^{--}	HCO_3^-	TOTAL Anions
Before Leaching	0-30	1.0	3.5	2.9	0.3	5.7	12.4	2.6	5.5	0.0	4.5	12.6
1st.Leach.		0.8	2.7	1.6		5.0	9.3	1.2	4.4	0.0	4.0	9.6
2nd.Leach.		0.8	1.4	2.9		5.3	9.6	2.4	2.4	0.0	5.1	9.9
Before Leaching	30-60	1.3	2.8	2.4	0.2	9.0	14.7	2.6	7.0	0.0	5.0	14.6
1st.Leach.		1.6	5.1	4.8		8.5	18.4	2.0	12.5	0.0	3.8	18.3
2nd.Leach.		0.9	1.0	2.3		6.0	9.2	1.7	4.0	0.0	3.7	9.4
Before Leaching	60-90	4.9	2.3	14.2	0.1	30.0	67.4	5.8	60.0	0.0	4.5	70.3
1st.Leach.		4.2	23.1	15.3		17.6	56.0	4.0	46.0	0.0	3.0	53.0
2nd.Leach.		3.7	29.8	13.6		12.2	55.6	2.9	48.4	0.0	1.8	53.0

N° SERIE : 02.1
N° PROFILE : 369







TREATMENT = APPLICATION OF WATER ONLY.

CHANGES IN ELECTRICAL CONDUCTIVITY, TOTAL CATIONS AND TOTAL ANIONS MEASURED AT BEGINNING AND END, IN PERCOLATED WATER.
(LYS. EXP.)

TABLE NO. 7

CHANGE IN CHEMICAL COMPOSITION OF PERCOLATING WATER DURING DIFFERENT RECLAMATION TREATMENTS (Lys. Exp.)

Ser. 02.1
Prof. 369

TREATMENTS	SAMPLING TIME[1]	pH	E C x10^3 mmhos/cm at 25°c	(meq./Liter) Ca^{++}	Mg^{++}	K^+	Na^+	TOTAL Cations	Cl^-	SO_4^{--}	CO_3^{--}	HCO_3^-	TOTAL Anions
First	A	8.2	29.6	64.0	58.0	0.63	254.0	376.0	285.0	82.5	0.0	7.5	375.0
	B	7.9	28.3	73.0	92.0	0.33	212.0	377.0	270.0	85.0	0.0	10.0	365.0
Second	A		16.4	35.2	36.0	0.9	114.0	185.4	95.0	93.0	0.0	2.5	190.5
	B		15.0	29.0	38.0	0.21	109.0	176.21	79.0	100.0	0.0	2.5	181.5
Third	A		9.7	23.2	11.8		89.6	124.6	20.0	100.0	0.0	1.70	121.1
	B	6.8	10.6	9.1	9.1		105.6	148.8	13.0	128.0	0.0	1.40	142.4
Fourth	A	7.0	6.6	20.2	11.6		56.0	87.8	2.7	84.0		1.0	87.7
	B		7.2	21.5	20.0		56.0	97.5	3.0	93.0		1.24	97.24

First treat.(gyps.= 0 gm/m2 and water 20 cm),Second treat.(gyps.= 0 gm/m2 and water 20 cm), Third treat.(gyps.= 0 gm/m2 and water 20 cm),Fourth treat.(gyps.= 0 gm/m2 and water 20 cm), plowing and levelling followed the application of gypsum in each time.

1 - Leachate samples are taken at "A" begining and "B" end of each percolating time.

TABLE NO. 8 A

CHANGE IN SOIL PROPERTIES UNDER RECLAMATION IN PROJECT AREA (Lys. Exp.)

Sec. 03.7
Prof. 9 246

	DEPTH IN cm	SAT. %	pH	CAL-CAR.	ORG. MAT.	N %	TEXT.	(meq./100 gm soil) EXCHANGEABLE - CATION - PERCENTAGES SUM	Ca^{++}	Mg^{++}	K^{+}	Na^{+}	TOTAL	GYPS.	P_2O_5 P.P.M.
Before Leaching	0-30	49.0		4.4	4.5	2.1	FAL	44.9	28.6	8.2	3.7	4.4	43.2	11.2	420.0
1st.Leach.		60.0	8.2	5.5	4.5			44.3	30.6	7.2	3.0	3.5	46.8	5.2	350.0
Before Leaching	30-60	64.0		0.9		1.3	FAL	51.2	35.6	5.6	2.0	8.0	48.4	10.4	395.0
1st.Leach.		72.0	8.0	1.0		2.8		46.5	26.7	11.1	1.8	6.9	48.0	10.6	462.0
Before Leaching	60-90	81.0		0.8		1.1	AL	56.0	22.0	12.3	1.9	19.8	52.8	11.2	515.0
1st.Leach.		58.0	8.0	0.8		1.5		53.1	25.1	9.3	1.7	17.0	52.0	1.6	5.6

TABLE No. 8 B

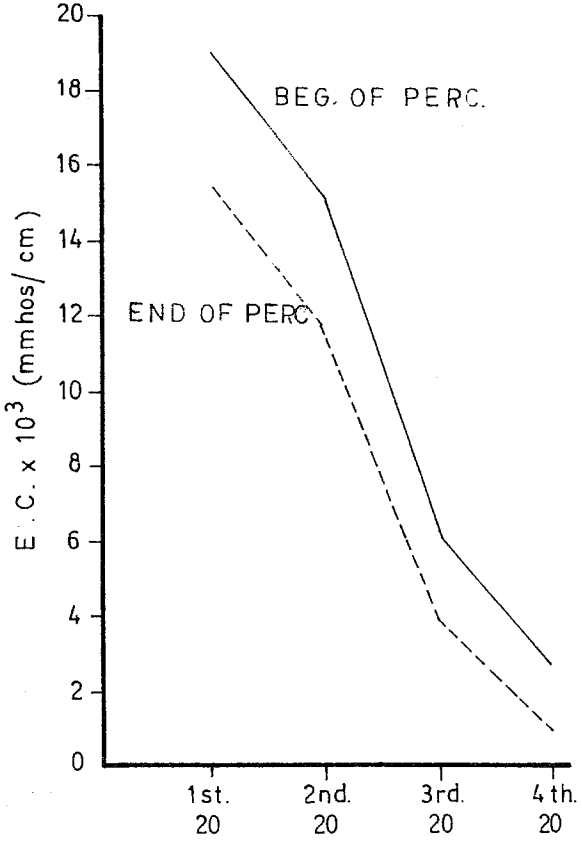
CHANGES IN SOIL PROPERTIES UNDER RECLAMATION IN PRODUCT AREA

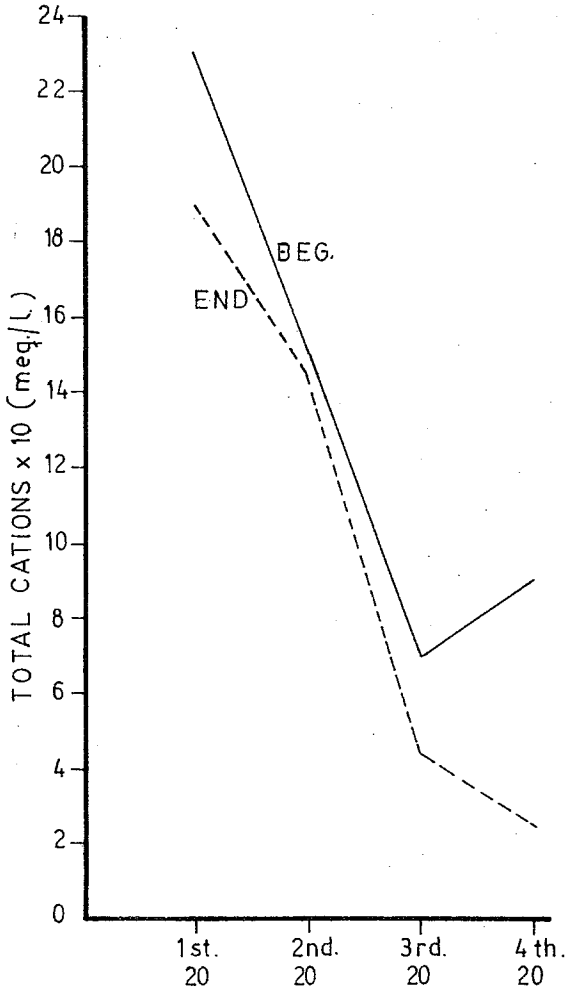
(SATURATION EXTRACT ANALYSIS)(Lys. Exp.)

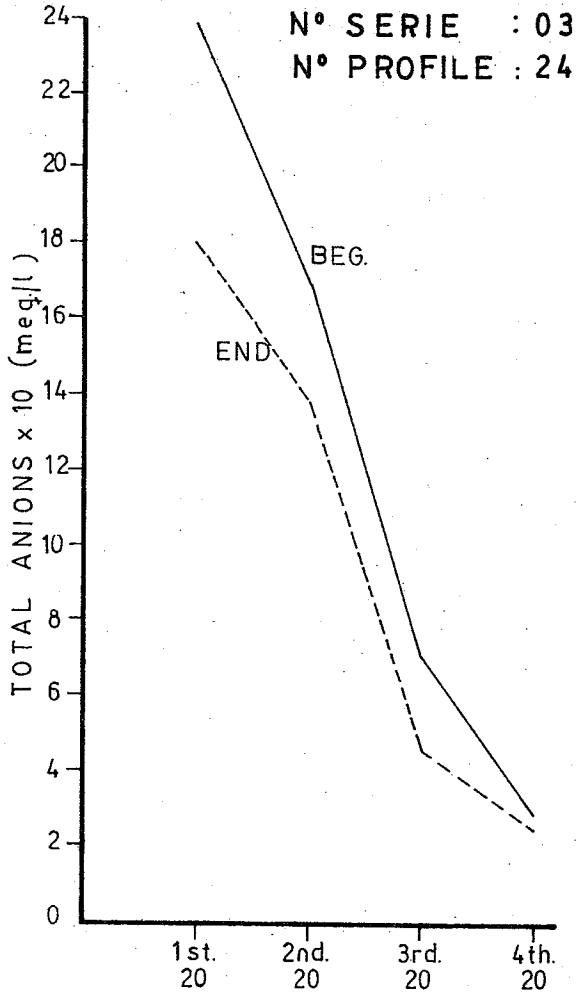
Ser. 03.2
Prof. 246

	Depth in cm	E C x10^3 mmhos/cm	(meq./Liter) Ca^{++}	Mg^{++}	Σ$^+$	Na$^+$	Total Cations	Cl$^-$	SO$_4^{--}$	CO$_3^{--}$	HCO$_3^-$	Total Anions
Before Leaching	0-30	1.1	1.9	1.9		9.6	13.3	2.0	5.0		6.3	13.4
1st.Leach.		2.2	4.8	2.6		15.4	22.7	4.4	14.5		3.5	22.4
Before Leaching	30-60	5.3	17.8	6.7		37.2	61.7	4.7	54.0		2.3	60.9
1st.Leach.		4.1	10.9	5.3		32.0	48.2	3.8	42.0		1.4	49.2
Before Leaching	60-90	11.9	25.0	16.0		108.8	151.8	24.0	125.0		5.0	154.0
1st.Leach.		9.7	22.5	13.7		86.4	122.6	6.5	120.0		2.6	129.1

N° SERIE : 03.2
N° PROFILE : 246







TREATMENT = RECEIVED A TOTAL OF 8 TONES OF GYPSUM/HECT. IN 4 PORTIONS.

CHANGES IN ELECTRICAL CONDUCTIVITY, TOTAL CATIONS AND TOTAL ANIONS MEASURED AT BEGINNING AND END, IN PERCOLATED WATER.

(LYS. EXP.)

TABLE NO. 9

CHANGES IN CHEMICAL COMPOSITION OF PERCOLATING WATER DURING DIFFERENT RECLAMATION TREATMENTS (Lys. Exp.)

Ser. 03.2
Prof. 246

Treatments	Sampling Time[1]	pH	E C x10^3 mhos/cm at 25°c	(meq./liter)									
				Ca^{++}	Mg^{++}	K^+	Na^+	TOTAL Cations	Cl^-	SO_4^{--}	CO_3^{--}	HCO_3^-	TOTAL Anions
First	A	8.1	18.9	37.2	23.8	1.23	170.0	231.0	179.0	53.0	0.0	6.3	238.0
	B	7.6	15.6	184.0	40.6	0.33	130.0	189.0	121.0	49.0	0.0	11.3	181.3
Second	A		15.2	20.0	22.8	0.44	109.0	152.2	117.0	48.0	0.0	5.0	170.0
	B		11.7	31.0	23.0	0.21	92.0	146.0	93.0	40.0	0.0	5.0	138.0
Third	A	9.0	6.3	5.2	4.1		60.0	69.3	3.7	32.0	0.4	6.9	71.1
	B	8.6	3.96	3.8	0.5		40.0	44.3	20.5	19.0	1.0	5.5	46.0
Fourth	A		2.71	2.4	1.0		25.8	92.2	12.0	11.0	0.4	4.8	28.2
	B		2.33	2.6	1.8		22.2	26.6	8.8	8.2	0.4	7.0	24.4

First treat.(gypso.= 200 gm/m2 and water 20 cm), Second treat.(gypso.= 200 gm/m2 and water 20 cm), Third treat.(gypso.= 200 gm/m2 and water 20 cm), Fourth treat.(gypso.= 200 gm/m2 and water 20 cm), plowing and levelling followed the application of gypsum in each time.

1 - Leachate samples are taken at "A" begining and "B" end of each percolating time.

TABLE NO. 10 A

CHANGE IN SOIL PROPERTIES UNDER RECLAMATION IN PROJECT AREA (Lys. Exp.)

Ser. 03.2
Prof. 4 368

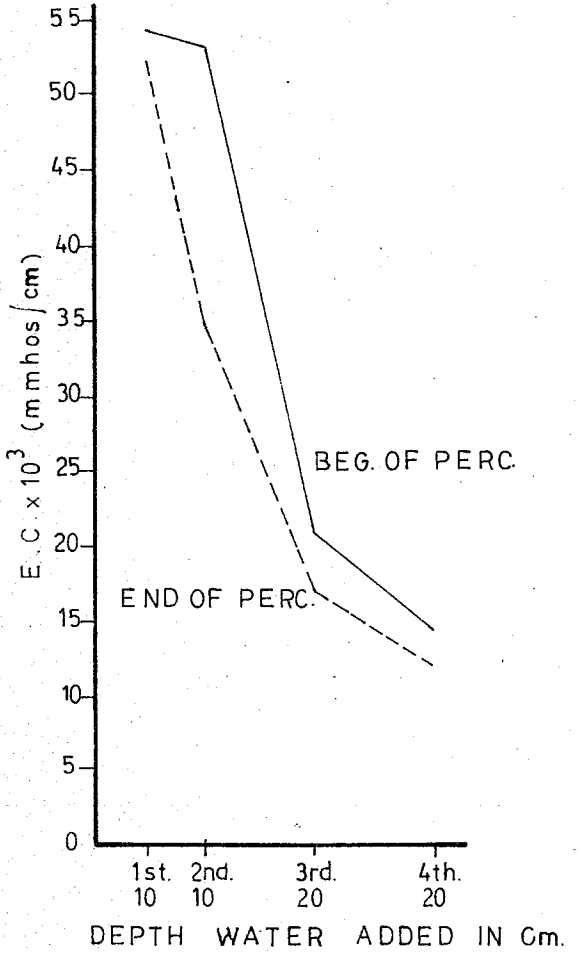
	DEPTH IN cm	SAT. %	pH	CAL-CAR.	ORG. MAT.	N %	TEXT.	(meq./100 gm soil) EXCHANGEABLE - CATION - PERCENTAGES SUM	Ca^{++}	Mg^{++}	K^{+}	Na^{+}	TOTAL	GYPS.	P_2O_5 P.P.M.
Before Leaching	0-30	59.0	7.9	0.3	1.3	0.6	FL	26.0	15.2	9.2	0.8	0.9	25.2	20.2	221.0
1st.Leach.		46.0		0.4	1.8	1.3	FL	25.0	15.8	6.2	1.6	1.4	24.0	14.0	231.0
2nd.Leach.		44.0			1.3			25.5	17.6	5.4	1.5	1.0	25.6	5.6	203.0
Before Leaching	30-60	73.0	8.3	5.0	0.6	0.3	FL	29.6	19.8	6.4	0.9	2.6	30.8	5.6	221.0
1st.Leach.		54.0		1.6		0.8	FAL	29.1	18.1	5.7	1.6	3.9	28.0	12.4	240.8
2nd.Leach.		52.0		2.3	0.2			33.1	20.7	7.7	1.5	3.2	32.0	5.2	231.0
Before Leaching	60-90	55.0	8.2	3.6	0.3	0.2	L	38.7	22.8	6.8	0.9	8.2	36.0	7.2	221.0
1st.Leach.		40.0		2.5	0.4		FL	36.1	18.2	5.0	1.5	11.4	33.6		221.2
2nd.Leach.		36.0		2.3	0.9			27.6	17.6	2.7	1.4	5.9	27.6	4.8	241.0

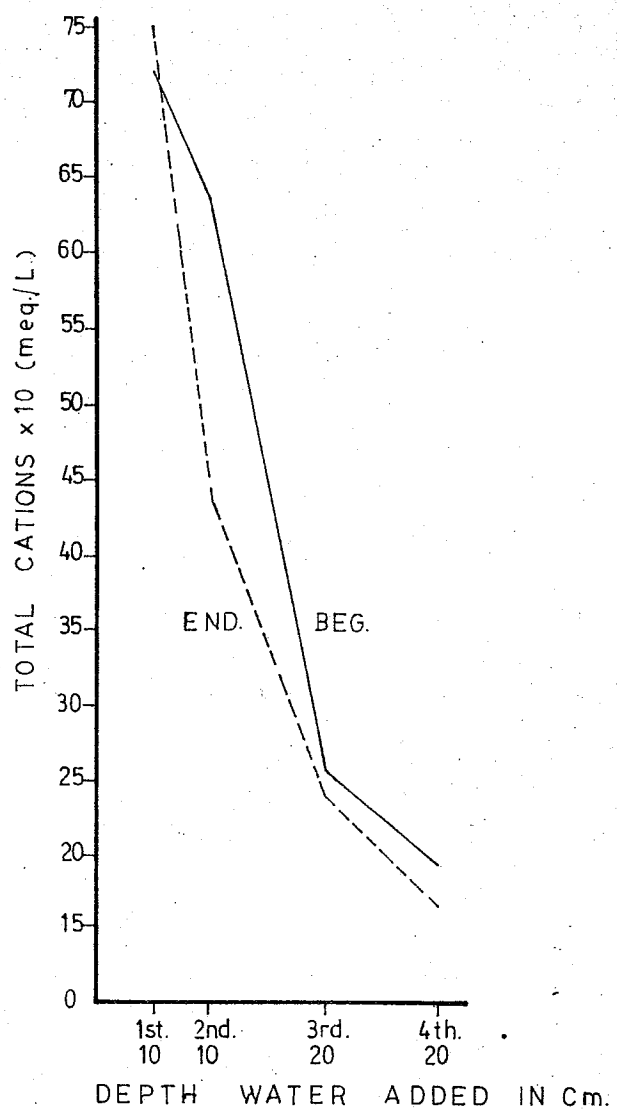
TABLE NO. 10 B

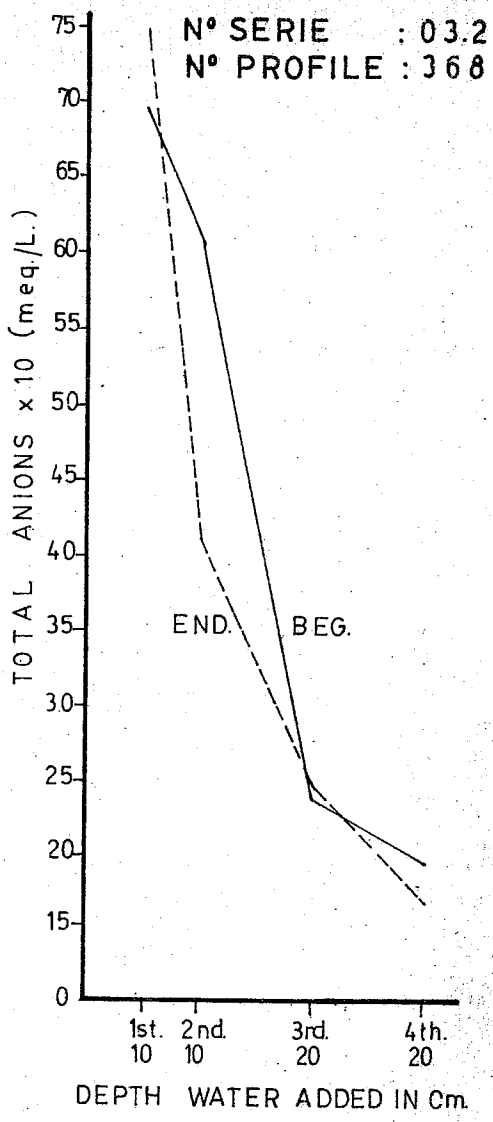
CHANGES IN SOIL PROPERTIES UNDER RECLAMATION IN PRODUCT AREA
(SATURATION EXTRACT DETERMINATIONS)(Lys. Exp.)

Ser. 03.2
Prof.4 368

	Depth IN cm	E C x10^{3} mmhos/cm	(meq./liter) Ca^{++}	Mg^{++}	K^{+}	Na^{+}	Total Cations	Cl^{-}	SO_4^{--}	CO_3^{--}	HCO_3^{-}	Total Anions
Before Leaching	0-30	0.9	2.1	1.3	0.2	7.6	11.2	3.0	3.0	0.0	4.5	11.5
1st.Leach.		1.1	2.6	2.4		6.7	11.7	1.3	7.2	0.0	3.6	12.0
2nd.Leach.		2.4	12.8	6.2		8.6	27.6	1.2	21.0	0.0	4.5	26.7
Before Leaching	30-60	5.3	16.2	14.1	0.7	38.8	69.8	3.6	60.0	0.0	5.5	68.1
1st.Leach.		2.4	3.9	3.6		21.6	29.9	2.4	21.5	0.0	5.5	29.4
2nd.Leach.		3.9	15.2	9.6		24.0	49.2	1.2	47.0	0.0	4.0	52.2
Before Leaching	60-90	15.0	27.2	29.8	1.1	128.0	186.1	94.0	100.0	0.0	4.5	196.0
1st.Leach.		7.7	22.3	16.1		57.6	96.0	3.6	88.0	0.0	4.0	95.6
2nd.Leach.		7.8	28.4	16.8		59.6	104.8	5.6	100.0	0.0	5.0	110.6







TREATMENT = RECEIVED A TOTAL OF 8 TONES OF GYPSUM/HECT. IN 4 PORTIONS.

CHANGES IN ELECTRICAL CONDUCTIVITY , TOTAL CATIONS AND TOTAL ANIONS MEASURED AT BEGINNING AND END , IN PERCOLATED WATER.

(LYS. EXP.)

Table No. 11

CHANGE IN CHEMICAL COMPOSITION OF PERCOLATING WATER DURING DIFFERENT RECLAMATION TREATMENTS (Lys. Exp.)

Ser. 03.2
Prof. 368

Treatments	Sampling Time[1]	pH	E C x10^3 mmhos/cm at 25°c	(meq./Liter)									
				Ca^{++}	Mg^{++}	K^+	Na^+	TOTAL Cations	Cl^-	SO_4^{--}	CO_3^{--}	HCO_3^-	TOTAL Anions
First	A	7.5	54.1	166.0	152.0	2.8	404.0	722.0	618.0	76.0	0.0	75.0	701.5
	B	7.5	51.9	140.0	218.0	1.32	396.0	755.0	670.0	75.0	0.0	10.0	755.0
Second	A		33.5	124.0	168.0	1.3	336.0	629.3	554.0	53.5	0.0	2.5	610.0
	B		34.6	94.0	88.0	1.22	252.0	435.22	326.0	87.0	0.0	5.0	418.0
Third	A	6.9	20.6	7.8	5.6		190.0	253.4	136.0	110.0	0.0	2.1	247.7
	B	6.9	16.6	32.4	24.0		180.0	236.4	66.0	182.5	0.0	1.60	250.1
Fourth	A		14.4	38.5	10.5		143.2	192.2	45.0	150.0	0.0	0.9	195.9
	B		11.9	23.6	18.2		120.0	162.0	17.0	141.0	0.0	1.1	159.1

First treat.($CaSO_4$ = 200 gm/m2 and water 10 cm), Second treat.($CaSO_4$ = 200 gm/m2 and water 10 cm), Third treat.($CaSO_4$ = 200 gm/m2 and water 20 cm), Fourth treat.($CaSO_4$ = 200 gm/m2 and water 20 cm), plowing and levelling followed the application of gypsum in each time.

1 - Leachate samples are taken at "A" begining and "B" end of each percolating time.

TABLE NO. 12 A

CHANGE IN SOIL PROPERTIES UNDER RECLAMATION IN PROJECT AREA (Lys. Exp.)

Ser. 04.3
Prof. 12 367

	DEPTH IN cm	SAT. %	pH	CAL-CAR.	ORG. MAT.	N %	TEXT.	(meq./100 gm soil) EXCHANGEABLE CATION PERCENTAGES SUM	Ca^{++}	Mg^{++}	K^{+}	Na^{+}	TOTAL	GYPS.	P_2O_5 P.P.M.
Before Leaching	0-30	32.0		0.2	0.6		FL	17.5	12.6	3.2	1.2	0.5	17.5	14.4	151.2
1st.Leach.		34.0	7.5	V	1.1			15.3	10.9	3.0	1.2	0.3	15.2	1.6	175.0
Before Leaching	30-60	33.0		0.2	0.3		FL	18.5	14.1	2.9	1.0	0.5	18.4	38.4	110.6
1st.Leach.		34.0	8.0	V	0.6			16.2	13.6	1.3	0.9	0.4	16.0	0.4	126.0
Before Leaching	60-90	35.0		2.1	0.2		FL	20.6	11.4	6.4	0.9	2.0	20.4		40.6
1st.Leach.		34.0	8.1	2.5	0.4			21.2	18.2	1.5	1.0	0.5	20.0	1.2	57.4

TABLE NO. 12 B

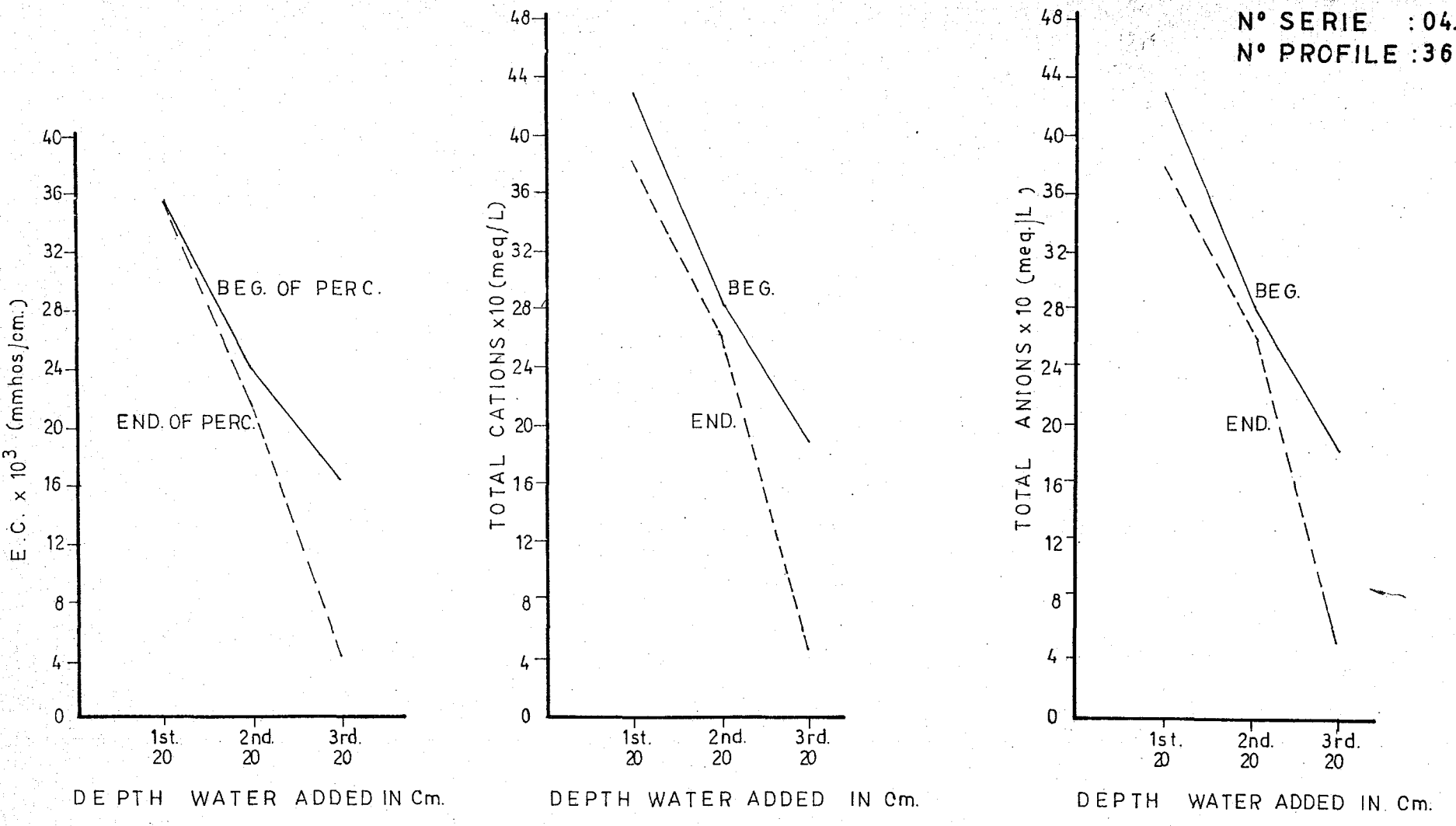
CHANGE IN SOIL PROPERTIES UNDER RECLAMATION IN PROJECT AREA

(SATURATION EXTRACT DETERMINATIONS)(Lys. Exp.)

Ser. 04.3
Prof. 12 367

	DEPTH IN cm	E C x10^3 mmhos/cm	(meq./Liter) Ca^{++}	Mg^{++}	K^+	Na^+	TOTAL Cations	Cl^-	SO_4^{--}	CO_3^{--}	HCO_3^-	TOTAL Anions
Before Leaching	0-30	0.7	2.4	1.3		4.6	8.3	1.0	4.8		3.0	8.8
1st.Leach.		1.1	5.9	2.0		4.6	12.4	2.5	2.7	0.0	7.5	12.7
Before Leaching	30-60	0.7	2.8	1.8		3.8	8.3	3.0	2.0	0.0	3.5	8.5
1st.Leach.		0.9	5.4	1.0		4.9	11.2	2.2	3.9	0.0	5.5	11.6
Before Leaching	60-90	10.3	42.0	66.0		1.7	109.7	91.5	17.0	0.0	5.5	113.0
1st.Leach.		0.7	2.0	1.3		5.0	8.3	5.6	2.0	0.0	1.4	9.0

N° SERIE : 04.3
N° PROFILE : 367



TREATMENT = RECEIVED A TOTAL OF 2 TONES OF GYPSUM HECT. IN 1 PORTIONS.

CHANGES IN ELECTRICAL CONDUCTIVITY, TOTAL CATIONS AND TOTAL ANIONS MEASURED AT BEGINNING AND END, IN PERCOLATED WATER.
(LYS. EXP.)

EFFECT IN CHEMICAL COMPOSITION OF PERCOLATING WATER DURING DIFFERENT RECLAMATION PERIODS (Lys. Exp.)

Ser. 04.3
Prof. 367

TREAT-MENTS	SAMPLING TIME[1]	pH	E C x10^3 mhos/cm at 25°c	(meq./liter)									
				Ca^{++}	Mg^{++}	K^+	Na^+	TOTAL Cations	Cl^-	SO_4^{--}	CO_3^{--}	HCO_3^-	TOTAL Anions
First	A		35.2	116.0	90.0	3.1	220.0	426.0	390.0	81.0	0.0	5.0	436.0
	B		35.5	1.1	96.0	1.82	176.0	381.82	331.0	46.5	0.0	7.5	385.0
Second	A	7.2	24.0	72.0	18.0		186.0	276.0	214.0	70.0	0.0	0.9	284.0
	B	6.6	21.6	61.0	14.0		184.0	259.0	207.0	60.0	0.0	0.90	267.9
Third	A		16.1	59.0	11.0		118.0	188.0	146.0	36.5	0.0	1.2	183.7
	B		4.1	4.6	5.6		34.4	44.6	17.8	21.6	0.0	3.1	42.5
Fourth	A												
	B												

First treat. (gypso.= 0 gm/m2 and water 20 cm), Second treat.(gypso.= 200 gm/m2 and water 20 cm), Third treat. (gypso.= 0 gm/m2 and water 20 cm), plowing and levelling followed the application of gypsum in each time.

1 - Leachate samples are taken at "A" beginning and "B" end of each percolating time.

TABLE NO. 14 A

CHANGE IN SOIL PROPERTIES UNDER RECLAMATION IN PROJECT AREA (Lys. Exp.)

Ser. 05.3
Prof. 11 441

	DEPTH IN cm	CAT. %	pH	CAL-CAR.	ORG. MAT.	N %	TEXT.	(meq./100 gm soil) EXCHANGEABLE - CATION - PERCENTAGES SUM	Ca^{++}	Mg^{++}	K^{+}	Na^{+}	TOTAL	GYPS.	P_2O_5 P.P.M.
Before Leaching	0-30	24.0		0.6		0.7	FL	14.0	11.2	1.5	1.2	0.1	14.0	1.2	351.0
1st.Leach.		26.0	8.0	0.5	0.9			13.1	9.9	1.7	1.3	0.2	12.4	1.2	364.0
Before Leaching	30-60	20.0		1.9		0.6	FL	17.5	14.5	1.6	1.2	0.3	17.6	16.8	367.0
1st.Leach.		23.0	8.0	1.2	1.1			16.0	11.9	2.3	1.4	0.4	16.0	1.6	420.0
Before Leaching	60-90	20.0		5.6		0.5	FL	18.6	15.2	0.8	1.5	1.1	18.0		124.6
1st.Leach.		27.0	8.2	5.0	0.8			17.0	12.1	2.4	1.4	1.1	16.0	0.8	121.8

TABLE NO. 14 B

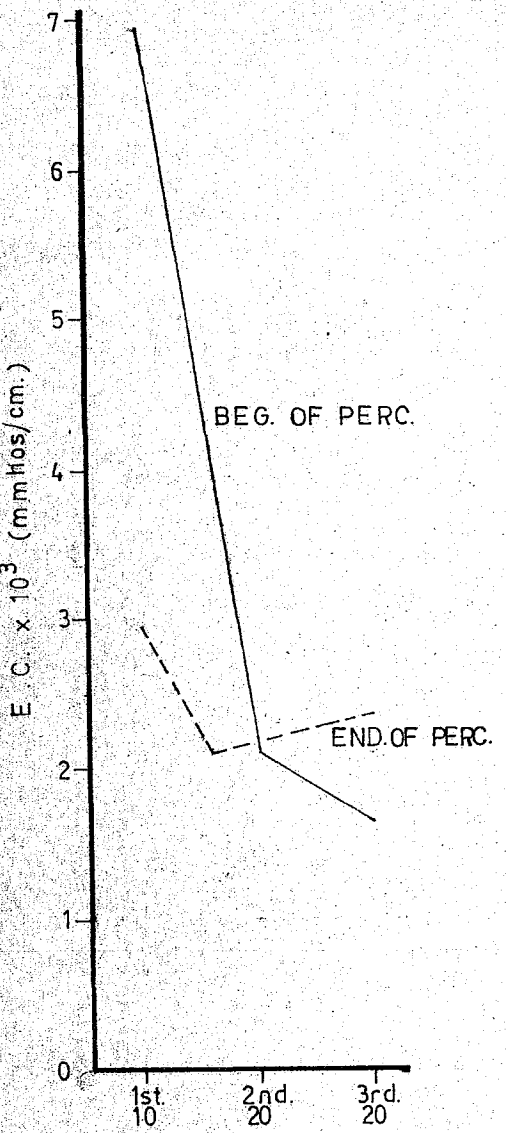
CHANGE IN SOIL PROPERTIES UNDER RECLAMATION IN PROJECT AREA

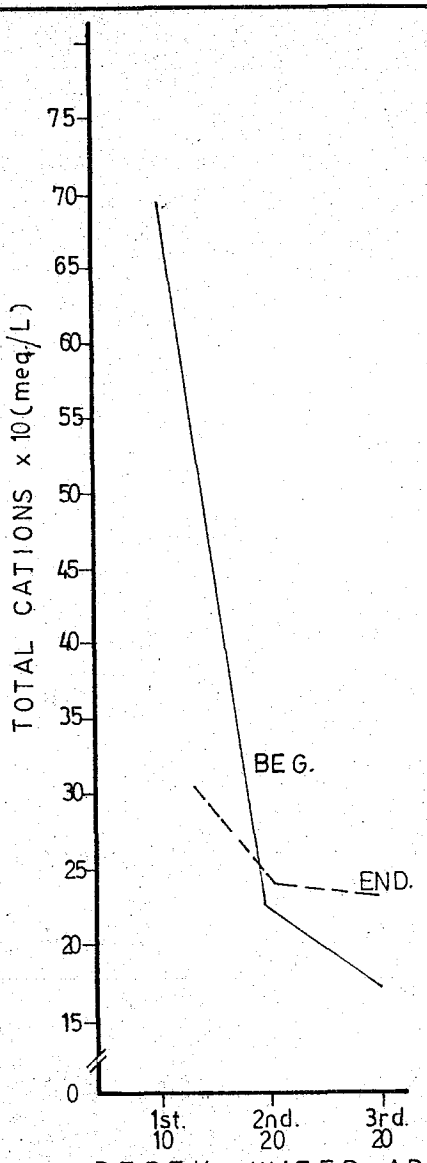
(SATURATION EXTRACT DETERMINATIONS)(Lys. Exp.)

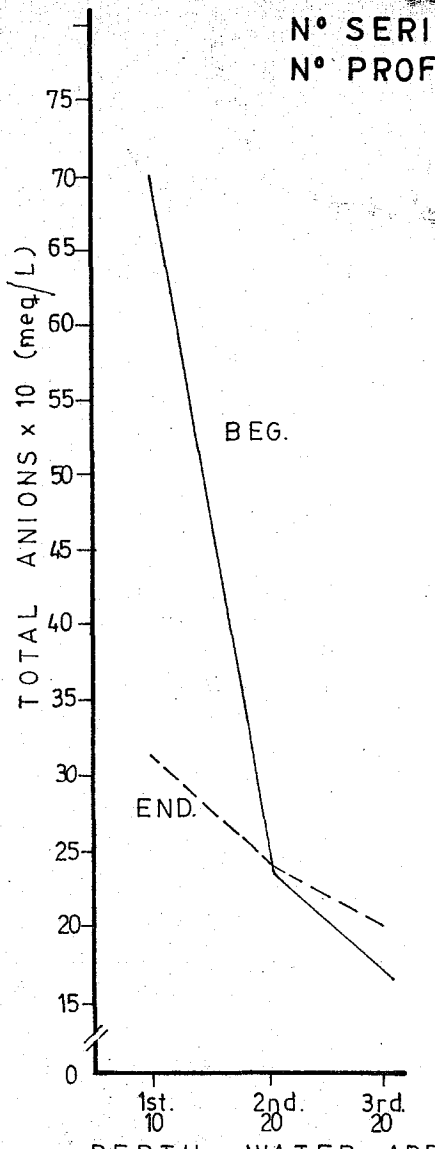
Ser. 05.3
Prof. 11 441

	DEPTH IN cm	E C x10^3 mmhos/cm	(meq./Liter) Ca^{++}	Mg^{++}	K^+	Na^+	TOTAL Cations	Cl^-	SO_4^{--}	CO_3^{--}	HCO_3^-	TOTAL Anions
Before Leaching	0-30	0.7	4.2	1.5		2.4	8.1	1.5	2.0	0.0	5.5	8.0
1st.Leach.		1.1	6.5	2.1		3.6	12.1	3.7	4.4	0.0	4.2	12.3
Before Leaching	30-60	0.6	2.7	0.9		2.1	5.6	1.5	1.8	0.0	2.5	5.7
1st.Leach.		1.3	9.9	0.5		4.9	15.3	6.0	8.5	0.0	1.5	16.0
Before Leaching	60-90	0.7	2.0	1.4		5.0	8.4	1.5	3.2	0.0	3.8	8.5
1st.Leach.		0.8	2.2	0.3		7.4	9.9	2.7	2.7	0.0	4.0	9.4

N° SERIE : 05.3
N° PROFILE : 441







TREATMENT = RECEIVED A TOTAL OF 2 TONES OF GYPSUM HECT. IN 1 PORTION.

CHANGES IN ELECTRICAL CONDUCTIVITY, TOTAL CATIONS AND TOTAL ANIONS MEASURED AT BEGINNING AND END, IN PERCOLATED WATER.

(LYS. EXP.)

TABLE NO. 15

CHANGE IN CHEMICAL COMPOSITION OF PERCOLATING WATER DURING DIFFERENT RECLAMATION TREATMENTS (Lys. Exp.)

Ser. 05.3
Prof. 441

TREATMENTS	SAMPLING TIME[1]	pH	E C x10^3 mmhos/cm at 25°c	(meq./Liter) Ca^{++}	Mg^{++}	K^+	Na^+	TOTAL Cations	Cl^-	SO_4^{--}	CO_3^{--}	HCO_3^-	TOTAL Anions
First	A		6.95	8.2	4.6	0.7	56.0	69.5	48.0	17.0	0.0	5.0	70.0
	B		2.9	4.0	1.8	0.3	24.4	30.5	15.0	9.5	0.0	6.4	30.9
Second	A	10.6	2.12	1.4	0.2		20.6	22.2	7.4	6.3	9.6	0.9	22.9
	B	9.3	2.13	1.2	0.5		22.0	23.7	4.1	7.5	4.60	7.3	23.5
Third	A		1.71	2.1	0.5		15.8	18.4	2.0	3.6	2.4	2.9	17.2
	B		2.5	1.0	0.1		23.2	22.3	7.6	4.0	2.8	7.0	21.4
Fourth	A												
	B												

First treat. (gyps.= 0 gm/m2 and water 10 cm), Second treat. (gyps.= 200 gm/m2 and water 20 cm), Third treat. (gyps.= 0 gm/m2 and water 20 cm), plowing and levelling followed the application of gypsum in each time.

1 - Leachate samples are taken at "A" begining and "B" end of each percolating time.

TABLE NO. 15 A

CHANGES IN SOIL PROPERTIES UNDER RECLAMATION IN PROJECT AREA (Lys. Exp.)

Ser. 06.1
Prof. 8 242

	DEPTH In cm	SAT. %	pH	CAL- CAR.	ORG. MAT.	N %	NAT.	(meq./100 gm soil) EXCHANGEABLE - CATION - PERMUTADS SUM	Ca^{++}	Mg^{++}	K^{+}	Na^{+}	TOTAL	GYPS.	P_2O_5 P.P.M.
Before Leaching	0-30	62.0		0.2		2.0	AL	42.5	36.4	4.4	1.3	0.5	44.2	5.6	255.0
1st.Leach.		63.0	6.4	V	4.0			41.4	36.9	2.9	1.4	0.2	40.0	1.2	240.8
Before Leaching	30-60	49.0		1.3		0.6	FAL	33.0	23.4	8.6	0.3	0.5	33.2	8.0	112.0
1st.Leach.		50.0	7.4	2.2	0.9			30.7	25.1	4.9	0.6	0.2	19.6	0.8	112.0
Before Leaching	60-90	40.0		1.4		0.4	FL	29.1	19.9	8.3	0.4	0.5	29.6	6.4	66.5
1st.Leach.		43.0	7.8	8.1	0.5			28.8	21.5	6.8	0.4	0.2	27.6	1.6	78.4

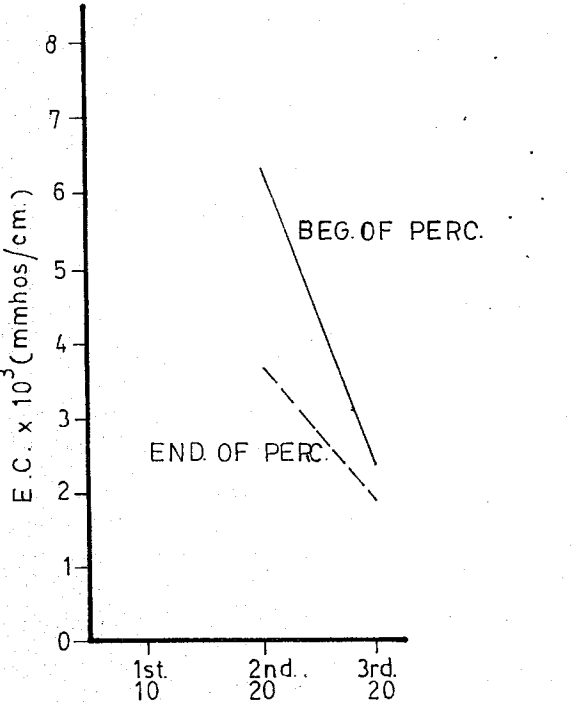
TABLE NO. 16 B

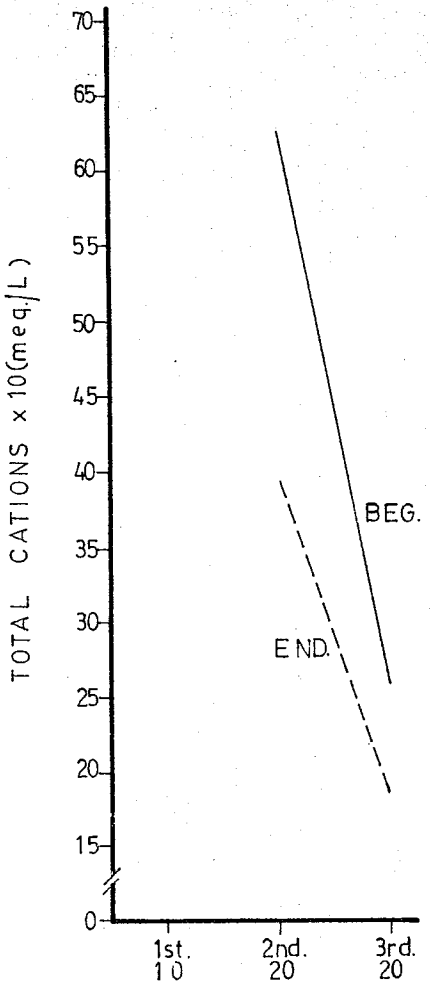
CHANGE IN SOIL PARAMETERS UNDER RECLAMATION IN PRODUCT AREA
(SATURATION EXTRACT DETERMINATIONS)(Lys. Exp.)

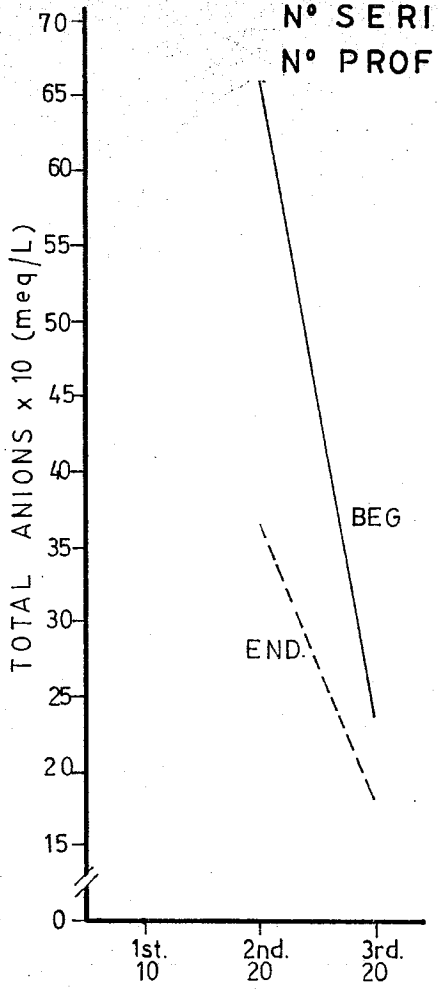
Ser. 06.1
Prof. 8 242

	DEPTH IN cm	E C x10^3 mhos/cm	(meq./Liter)									
			Ca^{++}	Mg^{++}	K^{+}	Na^{+}	TOTAL Cations	Cl^{-}	SO_4^{--}	CO_3^{--}	HCO_3^{-}	TOTAL Anions
Before Leaching	0-30	0.6	2.3	4.5		1.9	8.7	1.5	1.7		5.5	8.7
1st.Leach.		0.8	3.6	0.8		1.6	8.0	1.8	2.6		3.5	7.9
Before Leaching	30-60	0.5	3.1	0.9		1.7	5.6	1.2	1.2		3.3	5.6
1st.Leach.		0.8	4.0	1.9		1.4	7.4	2.5	2.4		3.0	7.9
Before Leaching	60-90	0.5	1.8	2.3		2.3	6.3	2.0	1.3		3.4	6.6
1st.Leach.		0.8	4.0	1.4		2.5	7.9	3.2	2.0		2.6	7.8

N° SERIE : 06.1
N° PROFILE : 242







TREATMENT = APPLICATION OF WATER ONLY. NO LEACHATE APPEARED AFTER 1st. APLICATION OF WATER.

CHANGES IN ELECTRICAL CONDUCTIVILY, TOTAL CATIONS AND TOTAL ANIONS MEASURED AT BEGINNING AND END, IN PERCOLATED WATER.

(LYS. EXP.)

CHANGES IN CHEMICAL COMPOSITION OF PERCOLATING WATER DURING DIFFERENT RECLAMATION TREATMENTS (Lys. Exp.)

Ser. 06.1
Prof. 242

TREATMENTS	SAMPLING TIME[1]	pH	E C x10^3 mmhos/cm at 25°c	(meq./Liter) Ca^{++}	Mg^{++}	K$^+$	Na$^+$	TOTAL Cations	Cl$^-$	SO$_4^{--}$	CO$_3^{--}$	HCO$_3^-$	TOTAL Anions
First	A												
	B												
Second	A	7.7	6.3	33.6	0.8		28.0	62.4	50.0	15.0	0.0	1.4	66.9
	B	7.0	3.64	15.4	5.4		18.0	38.8	27.5	8.7	0.0	1.10	37.3
Third	A		2.3	8.6	8.0		9.6	25.2	12.4	10.0	0.0	1.5	23.9
	B		1.97	8.4	3.0		8.4	19.2	9.8	7.0	0.0	1.8	18.6
Fourth	A												
	B												

First treat. (gyps.= 0 gm/m2 and water 10 cm), Second treat. (gyps.= 0 gm/m2 and water 20 cm), Third treat. (gyps.= 0 gm/m2 and water 20 cm), plowing and levelling followed the application of gypsum in each time.

1 - Leachate samples are taken at "A" begining and "B" end of each percolating time.

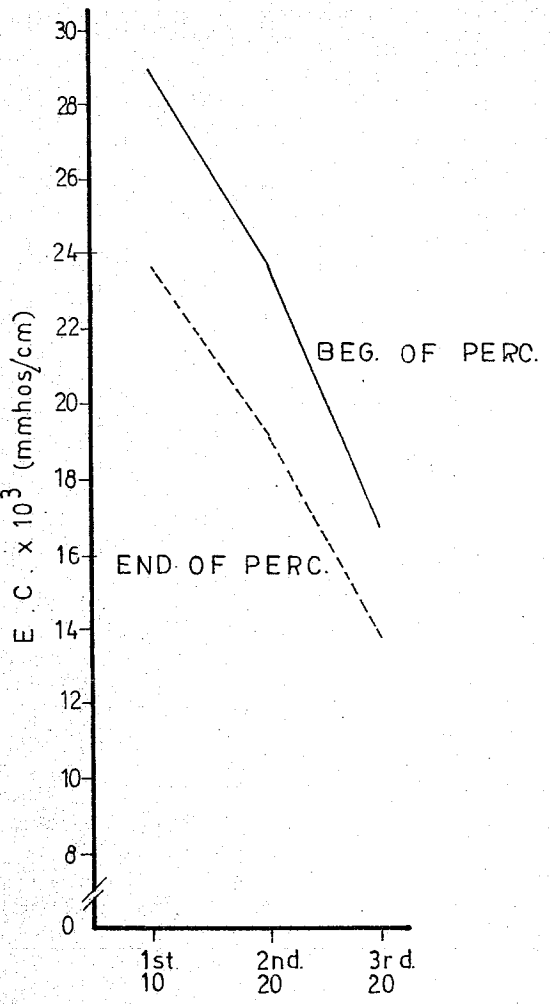
TABLE NO. 18 A

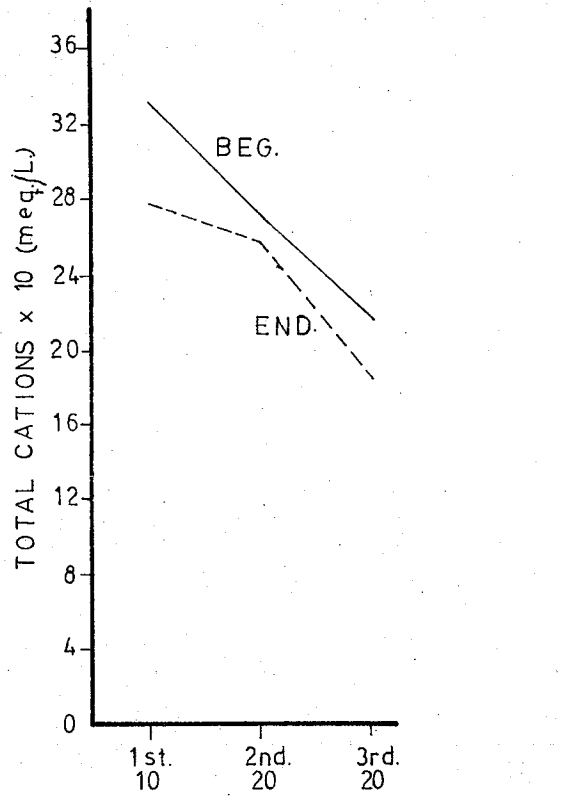
CHANGE IN SOIL PROPERTIES UNDER RECLAMATION IN PROJECT AREA (Lys. Exp.).

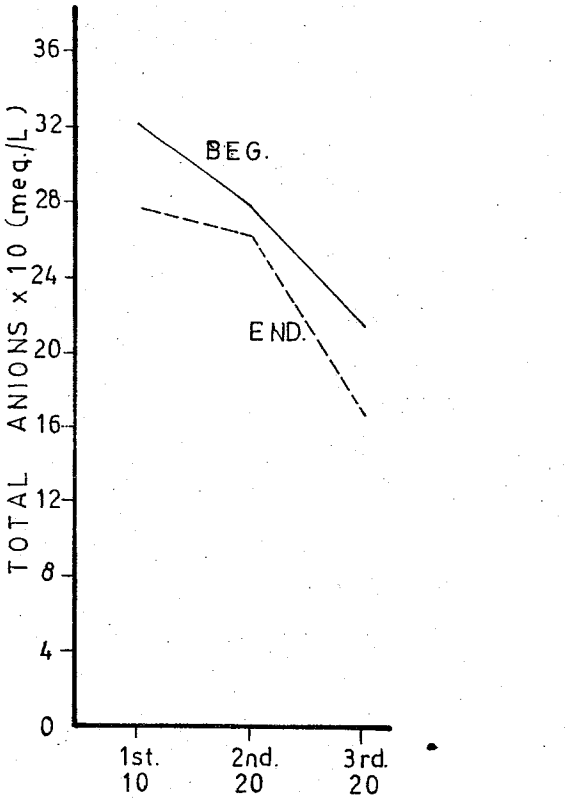
Ser. 07.2
Prof. 7 219

	DEPTH IN cm	SAT. %	pH	CAL. CAR.	ORG. MAT.	N %	NITR.	(meq./100 gm soil) EXCHANGEABLE CATION PERCENTAGES SUM	Ca^{++}	Mg^{++}	K^{+}	Na^{+} TOTAL	GYPS.	P_2O_5 P.P.M.
Before Leaching	0-30	37.0		V		1.2	FL	23.2	17.6	4.4	0.7	0.5 26.0	4.0	221.2
1st.Leach.		40.0	6.9	V	3.0			22.4	19.7	1.4	0.8	0.4 23.6	3.6	231.0
Before Leaching.	30-60	38.0		2.4		0.3	FL	21.6	14.4	3.8	0.4	0.9 22.4	4.0	46.2
1st.Leach.		40.0	7.5	3.1	1.1			19.5	14.3	5.2	0.5	0.5 18.8	4.0	99.4
Before Leaching	60-90	41.0		4.4		0.2	FL	27.8	19.4	5.0	0.5	3.0 26.8	4.8	57.6
1st.Leach.		41.0	7.8	5.0	0.5			22.0	14.3	6.2	0.4	1.0 21.2	0.8	30.8

Nº SERIE : 07.2
Nº PROFILE : 219







TREATMENT = APPLICATION OF WATER ONLY.

CHANGES IN ELECTRICAL CONDUCTIVITY , TOTAL CATIONS AND TOTAL ANIONS MEASURED AT BEGINNING AND END , IN PERCOLATED WATER.
(L Y S. EXP.)

Table No. 18 B

CHANGES IN SOIL PROPERTIES DURING RECLAMATION IN PROJECT AREA

(SATURATION EXTRACT DETERMINATIONS)(Lys. Exp.)

Ser. 07.2
Prof. 7 219

	DEPTH IN cm	E C x10^3 mmhos/cm	(meq./liter) Ca^{++}	Mg^{++}	K$^+$	Na$^+$	TOTAL Cations	Cl$^-$	SO$_4^{--}$	CO$_3^{--}$	HCO$_3^-$	TOTAL Anions
Before Leaching	0-30	0.6	3.0	2.0		2.8	7.9	2.5	1.7	0.0	3.8	7.9
1st.Leach.		1.0	6.6	1.6		2.4	10.6	2.9	5.1		2.3	10.2
Before Leaching	30-60	1.3	5.8	3.6		6.5	15.9	1.5	11.5	0.0	2.5	15.8
1st.Leach.		1.0	3.4	2.4		3.6	9.4	4.8	3.6		1.0	9.8
Before Leaching	60-90	5.5	23.9	17.6		34.4	75.9	4.6	66.7	0.0	2.0	73.3
1st.Leach.		2.8	13.4	8.4		12.8	34.6	3.0	30.0		1.6	34.7

TABLE No. 19

CHANGES IN CHEMICAL COMPOSITION OF PERCOLATING WATER DURING DIFFERENT RECLAMATION TREATMENTS (Lys. Exp.)

Ser. 07.2
Prof. 219

TREATMENTS	SAMPLING TIME[1]	pH	E C x10^3 mhos/cm at 25°c	(meq./liter)									
				Ca^{++}	Mg^{++}	K^{+}	Na^{+}	TOTAL Cations	Cl^{-}	SO_4^{--}	CO_3^{--}	HCO_3^{-}	TOTAL Anions
First	A		28.5	98.0	61.0	0.73	168.0	327.73	265.0	47.5	0.0	7.5	320.0
	B		23.3	94.0	36.0	0.55	144.0	274.6	209.0	64.0	0.0	5.0	278.0
Second	A	7.0	23.4	79.0	27.0		162.0	268.0	215.0	61.0	0.0	0.2	276.5
	B	6.8	19.1	62.0	16.0		180.0	258.0	160.0	100.0	0.0	1.10	261.0
Third	A		16.7	89.0	17.0		110.0	216.0	140.0	71.0	0.0	1.1	212.1
	B		13.7	44.4	22.8		104.0	171.2	83.0	82.0	0.0	1.4	166.4
Fourth	A												
	B												

First treat.(gypsum = 0 gm/m2 and water 10 cm), Second treat.(gypsum = 0 gm/m2 and water 20 cm), Third treat.(gypsum = 0 gm/m2 and water 20 cm), plowing and levelling followed the application of gypsum in each time.

1 - Leachate samples are taken at "A" begining and "B" end of each percolating time.

TABLE NO. 20 A

CHANGE IN SOIL PROPERTIES UNDER REGLAMATION IN PROJECT AREA (Lys. Exp.)

Ser. 08.2
Prof. 10 386

	DEPTH IN cm	SAT. %	pH	CAL= CAR.	ORG. MAT.	N %	REMK.	EXCHANGEABLE CATION PERCENTAGES (meq./100 gm soil) SUM	Ca^{++}	Mg^{++}	K^{+}	Na^{+}	TOTAL	GYPS.	P_2O_5 P.P.M.
Before Leaching	0-30	41.0		3.4	3.3	0.4	FL	32.8	26.6	3.4	0.8	2.1	34.0	8.0	64.0
1st.leach		44.0	8.1	2.1	0.3			37.6	28.8	2.2	0.8	6.9	34.4	2.1	134.4
Before Leaching	30-60	40.0		1.8	0.3	0.3	FL	35.1	23.6	2.6	0.7	8.2	33.2	9.6	106.4
1st.Leach		42.0	8.3	2.2	0.2			27.2	21.0	4.1	0.6	1.5	27.2	1.6	229.6
Before Leaching	60-90	38.0		1.2	0.1	0.2	FL	34.9	19.1	1.6	0.6	13.6	32.8		151.2
1st.Leach.		44.0	8.3	3.1	0.2			29.7	25.4	2.2	0.7	1.4	28.4	11.2	100.8

TABLE NO. 20 B

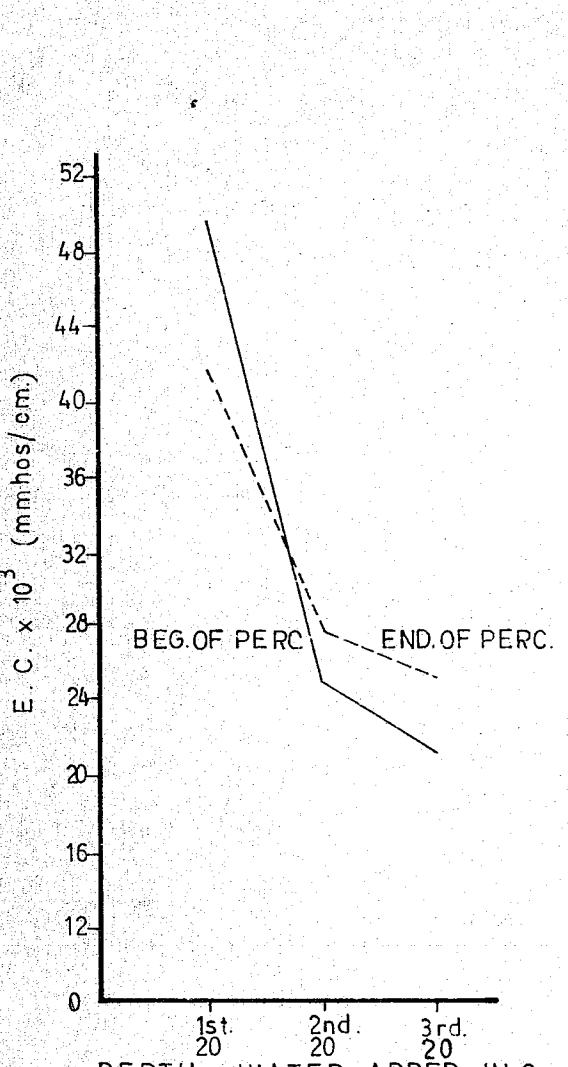
CHANGE IN SOIL PROPERTIES UNDER RECLAMATION IN PROJECT AREA

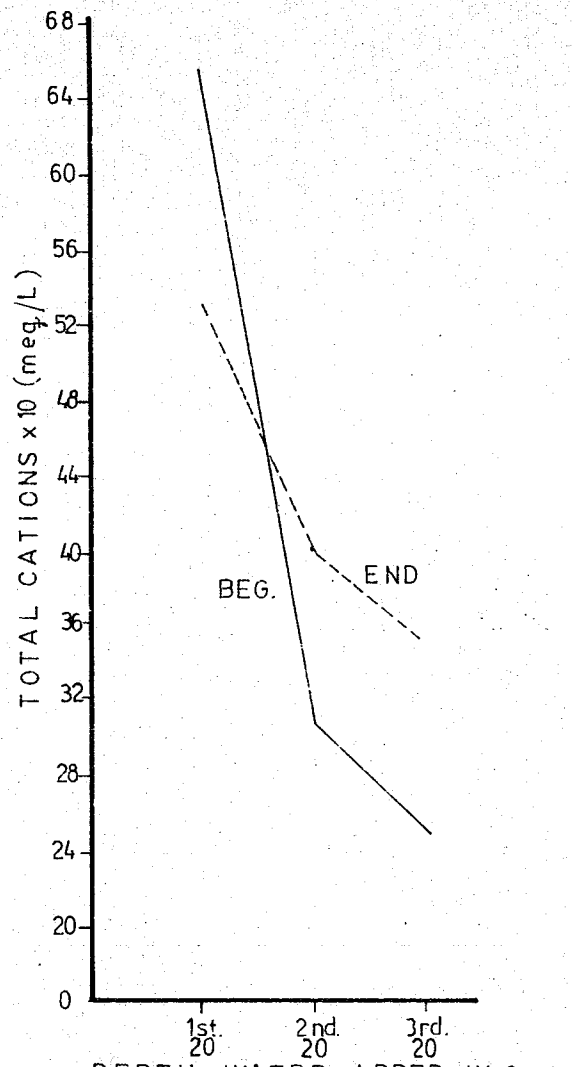
(SATURATION EXTRACT DETERMINATIONS)(Lys. Exp.)

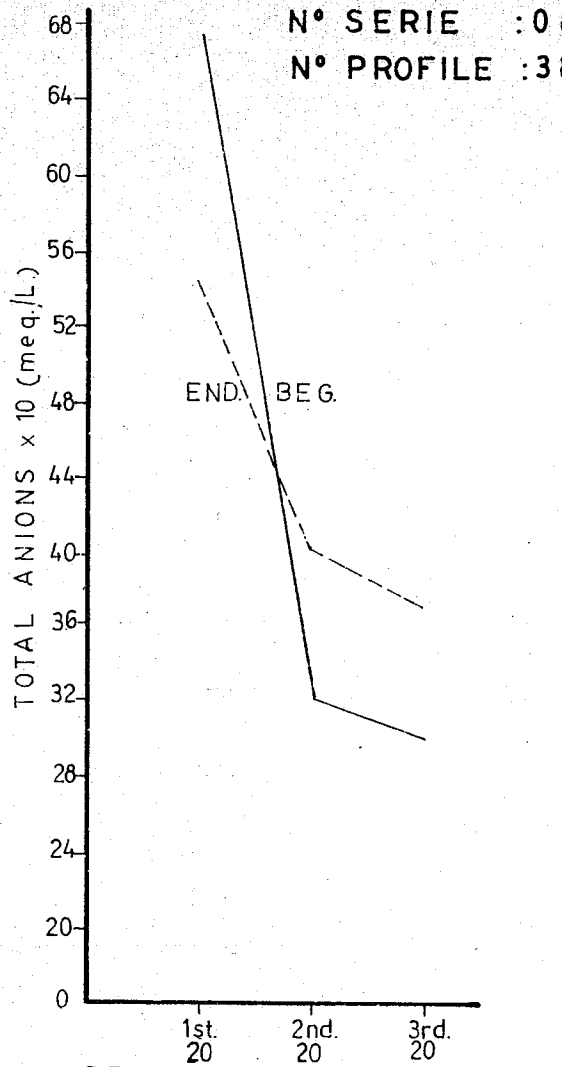
Ser. 08.2
Prof. 10 386

	DEPTH IN cm	E C x10^3 mmhos/cm	(meq./Liter) Ca^{++}	Mg^{++}	K^+	Na^+	TOTAL Cations	Cl^-	SO_4^{--}	CO_3^{--}	HCO_3^-	TOTAL Anions
Before Leaching	0-30	3.5	26.6	4.8	0.2	14.6	46.0	2.6	38.0		3.0	43.6
1st.Leach.		6.4	25.2	5.9		49.2	70.3	10.8	58.0	0.0	2.8	71.6
Before Leaching	30-60	6.5	21.3	8.9	0.2	54.4	84.6	4.8	74.0		2.5	81.3
1st.Leach.		11.8	21.9	9.4		122.4	153.7	8.0	150.0	0.0	2.3	160.3
Before Leaching	60-90	11.0	21.9	7.3	0.3	108.8	138.8	6.0	130.0		3.8	139.8
1st.Leach.		10.5	23.1	6.0		100.8	129.9	12.5	118.0	0.0	1.5	132.0

N° SERIE : 08.2
N° PROFILE : 386







TREATMENT = APPLICATION OF WATER ONLY.

CHANGES IN ELECTRICAL CONDUCTIVITY, TOTAL CATIONS AND TOTAL ANIONS MEASURED AT BEGINNING AND END, IN PERCOLATED WATER.
(LYS. EXP.)

TABLE NO. 21

CHANGE IN CHEMICAL COMPOSITION OF PERCOLATING WATER DURING DIFFERENT RECLAMATION TREATMENTS (Lys. Exp.)

Ser. 08.2
Prof. 386

Treatments	Sampling time[1]	pH	E C x10^3 mmhos/cm at 25°c	(meq./liter)									
				Ca^{++}	Mg^{++}	K^+	Na^+	TOTAL Cations	Cl^-	SO_4^{--}	CO_3^{--}	HCO_3^-	TOTAL Anions
First	A		51.4	41.0	105.0	0.03	508.0	654.83	373.0	292.5	0.0	2.5	668.0
	B		41.3	37.0	79.0	0.9	408.0	524.9	200.0	335.0	0.0	7.5	542.5
Second	A	6.6	24.3	23.2	14.8		270.0	308.0	110.0	210.0	0.0	0.5	320.9
	B	6.9	27.5	36.2	25.4		336.0	397.6	153.0	250.0	0.0	0.90	403.9
Third	A		21.2				244.0	245.1	90.0	210.0	0.0	1.2	301.2
	B		25.6				296.0	301.5	84.0	300.0	0.0	0.8	
Fourth	A												
	B												

First treat. (gypa.= 0 gm/m2 and water 20 cm), Second treat. (gyps.= 0 gm/m2 and water 20 cm), Third treat. (gyps.= 0 gm/m2 and water 20 cm), plowing and levelling followed the application of gypsum in each time.

1 - Leachate samples are taken at "A" begining and "B" end of each percolating time.

TABLE NO. 21 A

CHANGE IN SOIL PROPERTIES UNDER RECLAMATION IN PROJECT AREA (Lys. Exp.)

Ser. 03.2
Prof. 5 246

	DEPTH IN cm	SAT. %	pH	CAL-CAR.	ORG. MAT.	N %	TEXT.	(meq./100 gm soil) EXCHANGEABLE - CATION - PERCENTAGES SUM	Ca^{++}	Mg^{++}	K^{+}	Na^{+}	TOTAL	GYPS.	P_2O_5 P.P.M.
Before Leaching	0-30	63.0		0.7	4.5	1.5	FAL	41.5	31.8	7.2	0.8	3.7	44.6	15.2	176.0
1st.Leach.		66.0	7.3	1.3	4.3			44.8	32.0	10.0	0.9	1.9	42.0	7.2	85.4
Before Leaching	30-60	71.0		1.9	1.2	0.5	FAL	42.1	21.2	14.0	0.6	6.3	43.2	4.8	161.0
1st.Leach.		72.0	7.9	1.3	1.2			44.1	25.0	13.4	0.7	5.0	43.2	4.8	145.6
Before Leaching	60-90	70.0		9.9	0.7	0.4	FAL	42.3	19.8	15.0	0.5	7.1	40.0	11.2	70.0
1st.Leach.		69.0	2.1	11.0	0.8			41.4	21.0	13.8	0.6	6.5	40.0	2.8	54.6

TABLE NO. 22 B

CHANGE IN SOIL PROFILES UNDER RECLAMATION IN PROJECT AREA

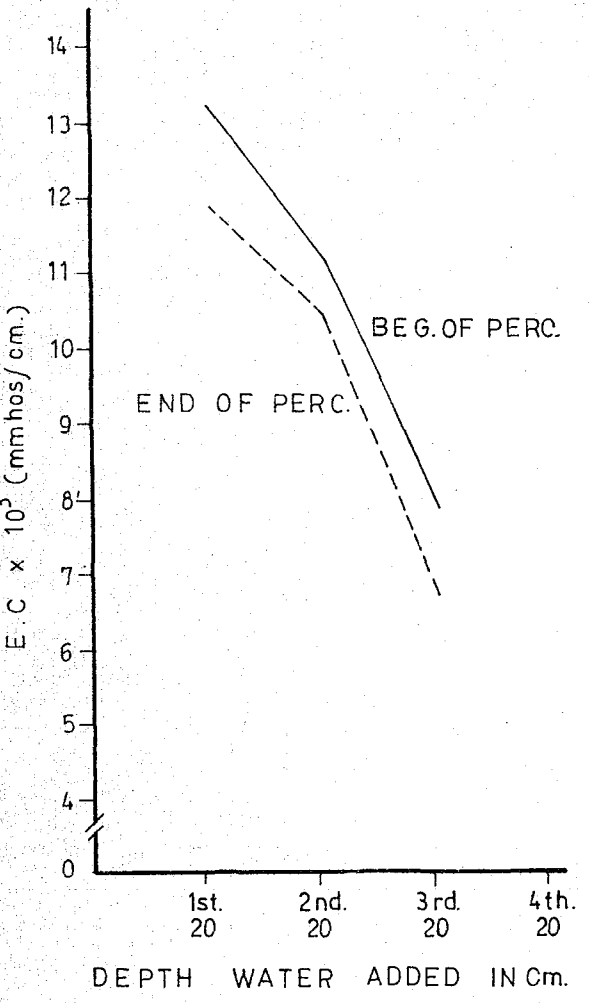
(SATURATION EXTRACT DETERMINATIONS)(Lys. Dep.)

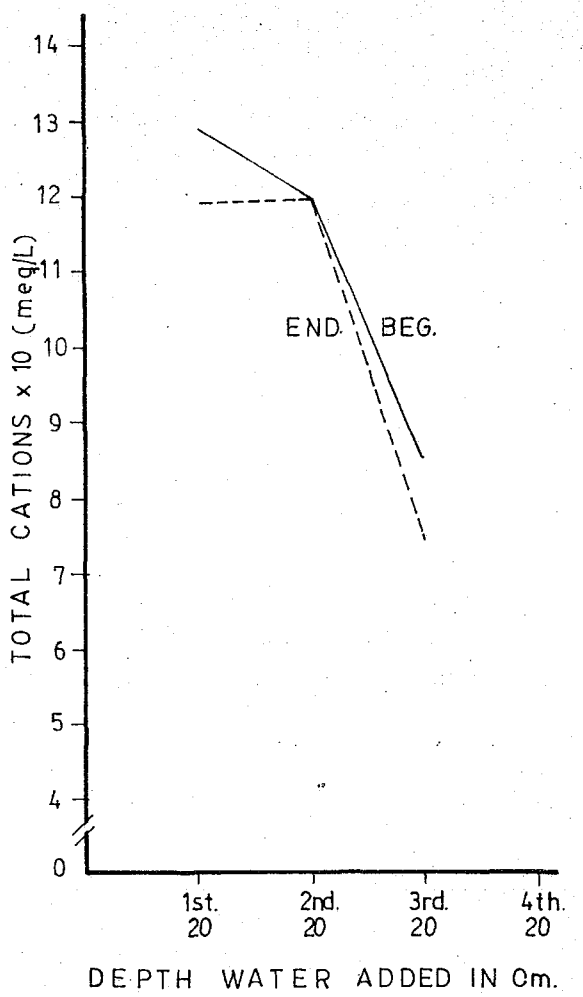
Ser. 03.2
Prof. 5 246

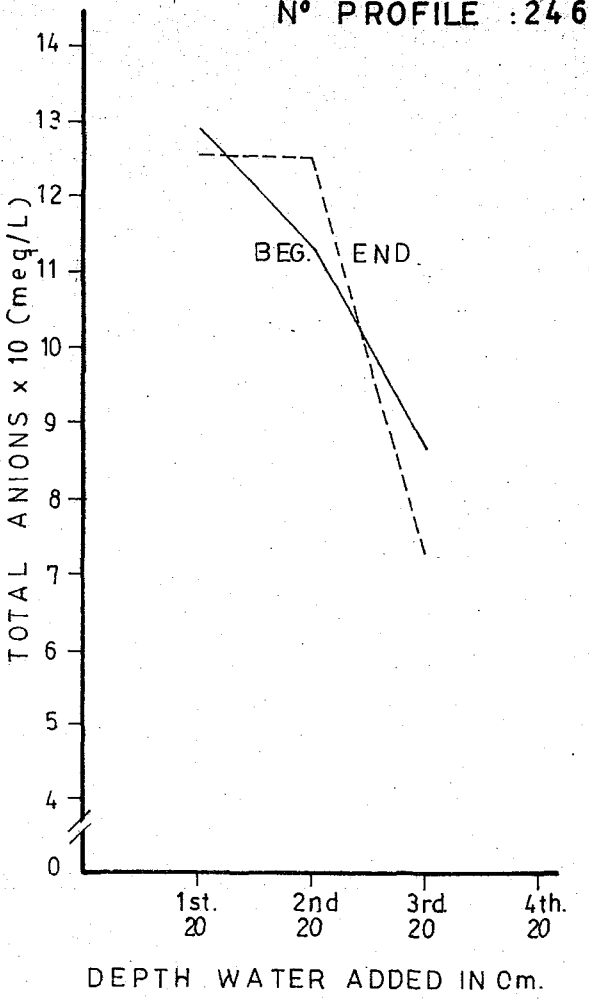
	DEPTH IN cm	E C x10^3 mmhos/cm	(meq./liter) Ca^{++}	Mg^{++}	K^+	Na^+	TOTAL Cations	Cl^-	SO_4^{--}	CO_3^{--}	HCO_3^-	TOTAL Anions
Before Leaching	0-30	1.9	6.0	4.7		12.8	23.5	6.9	12.5	0.0	4.5	23.9
1st.Leach.		2.3	10.1	6.9		10.6	27.6	6.5	13.0	0.0	8.5	28.0
Before Leaching	30-60	1.2	1.3	1.1	0.0	10.0	12.4	4.9	4.2	0.0	3.5	12.6
1st.Leach.		1.1	3.2	0.2		7.7	11.1	2.0	6.2	0.0	3.4	11.6
Before Leaching	60-90	2.1	1.6	1.6	0.0	18.4	21.6	9.0	8.5	0.0	4.3	21.8
1st.Leach.		1.2	1.1	0.4		8.1	9.5	2.4	3.1	0.0	4.0	9.5

Fig. 11

N° SERIE : 03.2
N° PROFILE : 246







TREATMENT = RECEIVED A TOTAL OF 8 TONES OF GYPSUM/HECT. IN 4 PORTIONS.

CHANGES IN ELECTRICAL CONDUCTIVITY, TOTAL CATIONS AND TOTAL ANIONS MEASURED AT BEGINNING AND END, IN PERCOLATED WATER.
(LYS. EXP.)

CHANGES IN ORDINAL CONCENTRATION OF PERCOLATING WATER DURING DIFFERENT RECLAMATION TREATMENTS (Lys. Exp.)

Ser. 03.2
Prof. 246

TREATMENTS	SAMPLING TIME[1]	pH	E C x10^3 mmhos/cm at 25°c	(meq./liter)									
				Ca^{++}	Mg^{++}	K^+	Na^+	TOTAL Cations	Cl^-	SO_4^{--}	CO_3^{--}	HCO_3^-	TOTAL Anions
First	A		13.1	14.8	14.4	0.97	97.6	127.8	96.0	33.0	0.0	0.70	129.7
	B		11.9	16.8	12.4	0.26	88.8	118.3	90.0	30.0	0.0	5.0	125.0
Second	A	8.5	11.1	14.4	2.8		100.8	118.0	85.0	35.0	0.8	1.1	112.1
	B	6.8	10.4	10.9	8.1		100.0	119.0	88.0	36.5	0.0	1.30	125.8
Third	A		7.8	8.2	5.6		71.2	85.0	56.0	29.5	0.0	1.1	86.6
	B		6.6	10.4	3.6		60.4	74.4	43.0	26.0	0.0	3.1	72.1
Fourth	A												
	B												

First treat.(gypso.= 200 gm/m2 and water 20 cm),Second treat.(gypso.= 200 gm/m2 and water 20 cm), Third treat.(gypso.= 200 gm/m2 and water 20 cm),plowing and levelling followed the application of gypsum in each time.

1 = Leachate samples are taken at "A" beginning and "B" end of each percolating time.

TABLE N° 24 A

EXAMPLES OF DIFFERENT TREATMENTS GIVEN TO SOILS OF THE PROJECT

1) NON SALINE - NON ALKALINE SOILS.

25 B I	26 B I	31 A I
25 B II	26 C I	33 A I
25 C II	26 C II	33 C I

2) SALINE SOILS.

25 C II	31 A II	33 A II
26 B II	32 A I	33 A III
27 C I	32 A II	33 C III

3) NON SALINE - ALKALINE SOILS.

25 B II	29 B I	36 B I
25 C III	29 B II	31 B I
28 B I		32 B I
28 B II		

4) SALINE - ALKALINE SOILS.

13 A I	13 C I	26 A I	27 A I
13 A II	13 C II	26 A II	27 A II
13 A III	13 C III	26 A III	27 A III
13 B I	25 A I	26 B II	27 B I
13 B II	25 A II	26 B III	27 B II
13 B III	25 A III	26 C III	27 B III
27 C I	25 B III		

Note:

EXAMPLE: 25 B I

Plot N° = 25
Subplots N° = B
Layer depth = I

TABLE N° 24 B

LOMA SERIES N° 08.2

1) Non Saline - Non Alkaline Soils

NONE

2) Saline Soils

18 C II, III
19 C II, I

3) Non Saline - Alkaline Soils

17 C I, I
17 C I, II
17 C I, III
17 C II, I

4) Saline - Alkaline Soils

16 C I, I	17 C II, II	20 C II, I
16 C I, II	17 C II, III	20 C II, II
16 C I, III	18 C II, I	20 C II, III
16 C II, I	18 C II, II	21 C II, I
16 C II, II	19 C II, II	21 C II, II
16 C II, III	19 C II, III	21 C II, III

Note:

EXAMPLE 16 C I, I

N° of Plots = Numbres (16)
N° of Subplots = letters (C I)
N° of layer depth = (I)

Where:

I = 0 - 30 cm.
II = 30 - 60 cm.
III = 60 - 90 cm.

TABLE N° 25

RESPONSE OF SALTY SOILS TO THE APPLICATION OF GYPSUM DISSOLVED IN ONE FOOT WATER DEPTH
EXPERIMENTAL STATION - VIEDMA PROJECT

PLOT	TOTAL SOLUBLE SALTS			EXCHANGEABLE Na. %			GYPSUM
N°	(0)	NT	% REMOVED	(0)	NT	% REMOVED	T/H.
43	26.4	2.14	92	26	27	+3	0.425
	21.0	4.1	81	21	16	24	
	10.8	12.9	+19	15	55	+266	
44	8.6	1.9	78	14	10.8	29	0.5100
	4.5	4.1	9	13	18.5	+42	
	1.8	8.5	+354	13	28.0	+113	
45	10.8	1.12	90	16	5.8	64	0.2550
	8.6	1.48	83	10	7.2	28	
	4.5	5.04	+12	4.7	19	+305	
46	18.7	0.76	96	17.5	8.0	53	0.5100
	7.95	1.02	87	10.0	10	0	
	2.78	2.85	+2	4.7	6.3	+34	
47	16.9	1.24	93	13.0	10.9	17	0.850
	9.8	1.96	80	11	8.0	27	
	3.3	4.12	+28	5	21	+320	
48	12.4	1.2	90	16	23	+43	0.425
	7.1	8.0	+14	19	31	+63	
	2.5	11.9	+379	9	40	+44	

TABLE 26 FIELD CALENDAR OF TREATMENTS

I PLOT N° 43

Area of plot: 400 m^2

II SEQUENCE OF FIELD OPERATIONS AND THEIR DATES.

Border construction, levelling, etc	12/7/67
Extraction of original samples	8/9/67

III NEW TREATMENTS (N.T.)

Gypsum application with one foot water depth 425/Kg./Ha.	3/4/68
Extraction of samples of gypsum dissolved	4/4/68
Extraction of samples after new treatment	30/5/68

IV TOTAL TIME OF FIELD OPERATIONS UNDER NATURAL CONDITIONS 6 months 25 days.

TABLE 27 FIELD CALENDAR OF TREATMENTS.

I PLOT N°44

Area of plot: 400 m^2

II SEQUENCE OF FIELD OPERATIONS AND THEIR DATES.

Border construction, levelling, etc.	12/7/67
Extraction of original samples	8/9/67

III NEW TREATMENTS

Gypsum application with one foot water depth 510 Kgs./Ha.	3/4/68
Extraction of samples of gypsum dissolved	4/4/68
Extraction of samples after new treatment	30/5/68

IV TOTAL TIME OF FIELD OPERATIONS UNDER NATURAL CONDITIONS 6 months 25 days.

TABLE 28 FIELD CALENDAR OF TREATMENTS.

I PLOT N° 45

Area of plot: 400 m^2

II SEQUENCE OF FIELD OPERATIONS AND THEIR DATES.

Border construction, levelling, etc.	12/7/67
Extraction of original samples	8/9/67

III NEW TREATMENTS (N.T.)

Gypsum application with one foot water depth 255 Kgs./Ha.	3/4/68
Extraction of samples of gypsum dissolved	4/4/68
Extraction of samples after new treatment	30/5/68

IV TOTAL TIME OF FIELD OPERATIONS UNDER NATURAL CONDITIONS 6 months 25 days.

TABLE 29 FIELD CALENDAR OF TREATMENTS

I PLOT N° 46

Area of plot: 400 m^2

II SEQUENCE OF FIELD OPERATIONS AND THEIR DATES.

Border construction, levelling, etc.	12/7/67
Extraction of original samples	8/9/67

III NEW TREATMENT (N.T.)

Gypsum application with one foot water depth 510 Kg./Ha.	3/4/68
Extraction of samples of gypsum dissolved	4/4/68
Extraction of samples after new treatment	30/5/68

IV TOTAL TIME OF FIELD OPERATIONS UNDER NATURAL CONDITIONS 6 months 25 days.

TABLE NO 30 FIELD CALENDAR OF TREATMENTS.

I PLOT N° 47

Area of plot: 400 m^2

II SEQUENCE OF FIELD OPERATIONS AND THEIR DATES.

Border construction, levelling, etc.	12/7/67
Extraction of original samples	8/9/67

III NEW TREATMENT (N.T.)

Gypsum application with one foot water depth 850 Kg./Ha.	3/4/68
Extraction of samples of gypsum dissolved	4/4/68
Extraction of samples after new treatment	30/5/68

IV TOTAL TIME OF FIELD OPERATIONS UNDER NATURAL CONDITIONS

6 months
25 days.

TABLE NO 31 FIELD CALENDAR OF TREATMENTS

I PLOT N° 48

Area of plot: 400 m^2

II SEQUENCE OF FIELD OPERATIONS AND THEIR DATES

Border construction, levelling, etc.	12/7/67
Extraction of original samples	8/9/67

III NEW TREATMENT

Gypsum application with one foot water depth 425 Kg./Ha.	3/4/68
Extraction of samples of gypsum dissolved	4/4/68
Extraction of samples after new treatment	30/5/68

IV TOTAL TIME OF FIELD OPERATIONS UNDER NATURAL CONDITIONS 6 months 25 days.

TABLE N° 32

AVERAGE OF RESPONSE IN THE 90 Cm. SOIL DEPTH
UPON THE APPLICATION OF GYPSUM
DISSOLVED IN ONE FOOT WATER DEPTH

PLOT N°	EXCHANGEABLE SODIUM % (0)	% REMOVED	(0)	% REMOVED	GYPSUM T/H	REMARKS
43	19.4	51	20.6	+81.6	0.4	Salinity reduced; alkalinity increased
44	4.96	+89	13.3	+42	0.5	Salinity increased; alkalinity increased
45	7.96	53.6	24.3	+71	0.3	Alkalinity increased
46	9.8	60.0	10.7	6.3	0.5	Salinity reduced; alkalinity reduced
47	10.0	48.3	9.7	+92	0.9	Salinity reduced; alkalinity increased
48	7.3	+100.6	14.6	+50	0.4	Salinity increased; alkalinity increased

TABLE N° 33

BEHAVIOUR OF SALINE ALKALINE SOILS
UNDER DIFFERENT TREATMENTS IN
EXPERIMENTAL STATION - VIEDMA PROJECT
LOMA SOILS (SERIES 08.2)

DEPTH cm.	SALT CHANGES EC in mmhos/cm (O)	(NT)	% SALT REMOVED	EXCHANGE Na. % CHANGES (O)	(NT)	% REMOVED
PLOT 20 C II						
NT: One foot depth of water						
0-30	21.8	1.9	92	15	7	53
30-60	21.4	4.7	79	35	13	63
60-90	25.1	16,7	33	40	22	45
PLOT 21 C II						
NT: One foot depth of water and 2.4 T/Hect. gypsium						
0-30	7	4.8	31	31	15	52
30-60	11.6	14.3	+23	40	22	45
60-90	19.7	21.4	8	40	31	22
PLOT 18 C II						
NT: Two feet depth of water						
0-30	19.6	3.3	83	33	17	48
30-60	12.1	6.8	44	30	15	50
60-90	5.9	11.8	+100	7	25	+257
PLOT 19 C II						
NT: Two feet depth of water and 3.8 T/Hect. gypsium						
0-30	4.6	2.9	37	13	12	8
30-60	7.9	9.6	+22	33	18	45
60-90	14.6	16.8	+15	35	27	24

TABLE N° 33 (CONTINUED)

DEPTH cm.	SALT CHANGES EC in mmhos/cm (O)	(NT)	% SALT REMOVED	EXCHANGE Na. % CHANGES (O)	(NT)	% REMOVED
PLOT 17 C II						
NT: Three feet depth of water						
0-30	3.5	1.4	61	25	8	68
30-60	10	6.7	34	27	16	41
60-90	19	9.7	49	40	23	43
PLOT 16 C II						
NT: Three feet depth of water and 3.8 T/Hect. gypsium						
0-30	7.7	1.2	84	22	11	50
30-60	17.6	1.4	92	38	27	29
60-90	26.3	6.6	75	43	16	63
PLOT 17 C I						
NT: Four feet depth of water						
0-30	3.9	5.3	+35	25	16	36
30-60	4.6	10	+116	27	30	+11
60-90	3.8	10	+163	28	30	+6
PLOT 16 C I						
NT: Four feet depth of water and 1 T/Hect. gypsium						
0-30	6.2	6.6	+26	20	19	5
30-60	11.4	9.5	17	35	27	23
60-90	13.8	10	28	40	27	32

NT: New Treatment; please see Field Calendar.

TABLE NO 34 FIELD CALENDAR OF TREATMENTS

I PLOT N° 16 C I

Area of Plot: 87.5 m2

II SEQUENCE OF FIELD OPERATIONS AND THEIR DATES

Sowing of sorghum, low development	24/1/67
First Leaching with 20 l/s till cover	28/1/67
Second Leaching with 20 l/s till cover	11/2/67
Third Leaching with 20 l/s till cover	6/3/67
Fourth Leaching with 20 l/s till cover	16/3/67
Fifth Leaching with 20 l/s till cover	14/4/67
Sorghum harvested, low yield	26/4/67
Extract of original samples (O)	13/7/67

III NEW TREATMENT (NT)

Gypsum application, plughed under 1 T/H	2/11/67
First Leaching with one foot water depth	8/4/68
Second Leaching with one foot water depth	11/6/68
Third Leaching with one foot water depth	8/7/68
Extraction of samples after new treatment	24/7/68

IV TOTAL TIME OF FIELD OPERATIONS UNDER NATURAL CONDITIONS: 8 months 22 days

TABLE 35 FIELD CALENDAR OF TREATMENTS

I PLOT N° 17 C I

Area of Plot: 87.5 m2

II SEQUENCE OF FIELD OPERATIONS AND THEIR DATES

Sowing of sorghum, low development	24/1/67
First leaching with 20 l/s till cover	28/1/67
Second leaching with 20 l/s till cover	11/2/67
Third leaching with 20 l/s till cover	6/3/67
Fourth leaching with 20 l/s till cover	16/3/67
Fifth leaching with 20 l/s till cover	14/4/67
Sorghum harvested, low yield	26/4/67
Extraction of original samples (O)	13/7/67

III NEW TREATMENT (NT)

Ploughed	2/11/67
First leaching with one foot water depth	8/4/68
Second leaching with one foot water depth	11/6/68
Third leaching with one foot water depth	8/7/68
Extraction of samples after New Treatment	24/7/68

IV	TOTAL TIME OF FIELD OPERATIONS UNDER	8 months
	NATURAL CONDITIONS	22 days

TABLE 36 FIELD CALENDAR OF TREATMENTS

I PLOT Nº 16 C II

Area of Plot: 87.5 m2

II SEQUENCE OF FIELD OPERATIONS AND THEIR DATES

Sowing of sorghum, low development	24/1/67
First leaching with 20 l/s till cover	28/1/67
Second leaching with 20 l/s till cover	11/2/67
Third leaching with 20 l/s till cover	6/3/67
Fourth leaching with 20 l/s till cover	16/3/67
Fifth leaching with 20 l/s till cover	14/4/67
Sorghum harvested, low yield	26/4/67
Extraction of original samples (0)	13/7/67

III NEW TREATMENT (NT)

Gypsum application, ploughed under 3.8 T/H	2/11/67
First leaching with one foot water depth	16/4/68
Second leaching with one foot water depth	11/6/68
Third leaching with one foot water depth	8/7/68
Extraction of samples after new treatment	24/7/68

IV TOTAL TIME OF FIELD OPERATIONS UNDER NATURAL CONDITIONS 8 months 22 days

TABLE 37 FIELD CALENDAR OF TREATMENTS

I PLOT Nº 17 C II

Area of Plot: 87.5 m2

II SEQUENCE OF FIELD OPERATIONS AND THEIR DATES

Sowing of sorghum, low development	24/1/67
First leaching with 20 l/s till cover	28/1/67
Second leaching with 20 l/s till cover	11/2/67
Third leaching with 20 l/s till cover	6/3/67
Fourth leaching with 20 l/s till cover	16/3/67
Fifth leaching with 20 l/s till cover	14/4/67
Sorghum harvested, low yield	26/4/67
Extraction of original samples (0)	13/7/67

III NEW TREATMENT (NT)

Ploughed	2/11/67
First leaching with one foot water depth	16/4/68
Second leaching with one foot water depth	11/6/68
Third leaching with one foot water depth	8/7/68
Extraction of samples after new treatment	24/7/68

IV	TOTAL TIME OF FIELD OPERATIONS	8 months
	UNDER NATURAL CONDITIONS	22 days

TABLE 38 FIELD CALENDAR OF TREATMENTS

I PLOT N° 19 C II

Area of Plot N° 87.5 m2

II SEQUENCE OF FIELD OPERATIONS AND THEIR DATES

Sowing of sorghum, low development	24/1/67
First leaching with 20 l/s till cover	28/1/67
Second leaching with 20 l/s till cover	11/2/67
Third leaching with 20 l/s till cover	6/3/67
Fourth leaching with 20 l/s till cover	16/3/67
Fifth leaching with 20 l/s till cover	14/4/67
Sorghum harvested, low yield	26/4/67
Extraction of original samples (O)	13/7/67

III NEW TREATMENT (NT)

Gypsum application, plughed under 3.8 T/H	2/11/67
First leaching with one foot water depth	16/4/68
Second leaching with one foot water depth	11/6/68
Extraction of samples after new treatment	24/6/68

IV TOTAL TIME OF FIELD OPERATIONS	8 months
UNDER NATURAL CONDITIONS	22 days

TABLE 39 FIELD CALENDAR OF TREATMENTS

I PLOT Nº 18 C II

Area of Plot: 87.5 m2

II SEQUENCE OF FIELD OPERATIONS AND THEIR DATES

Sowing of sorghum, low development	24/1/67
First leaching with 20 l/s till cover	28/1/67
Second leaching with 20 l/s till cover	11/2/67
Third leaching with 20 l/s till cover	6/3/67
Fourth leaching with 20 l/s till cover	16/3/67
Fifth leaching with 20 l/s till cover	14/4/67
Sorghum harvested low yield	26/4/67
Extraction of original samples (O)	13/7/67

III NEW TREATMENT (NT)

Ploughed	2/11/67
First leaching with one foot water depth	16/4/68
Second leaching with one foot water depth	11/6/68
Extraction of samples after new treatment	24/7/68

IV TOTAL TIME OF FIELD OPERATIONS	8 months
UNDER NATURAL CONDITIONS	22 days

TABLE 40 FIELD CALENDAR OF TREATMENTS

I PLOT N° 21 C II

Area of Plot: 87.5 m2

II SEQUENCE OF FIELD OPERATIONS AND THEIR DATES

Sowing of sorghum, low development	24/1/67
First leaching with 20 l/s till cover	28/1/67
Second leaching with 20 l/s till cover	11/2/67
Third leaching with 20 l/s till cover	6/3/67
Fourth leaching with 20 l/s till cover	16/3/67
Fifth leaching with 20 l/s till cover	14/4/67
Sorghum harvested, low yield	26/4/67
Extraction of original samples (O)	13/7/67

III NEW TREATMENT (NT)

Gypsum application, ploughed under	2/11/67
First leaching with one foot water depth	16/4/68
Extraction of samples after new treatment	24/7/68

IV	TOTAL TIME OF FIELD OPERATIONS	8 months
	UNDER NATURAL CONDITIONS	22 days

TABLE N° 42

CHANGE IN GROSS INTAKE RATE FOR LEACHING EXPERIMENTS

(Plot area = 400 m^2)

PLOT N°	GROSS INTAKE RATE mm/hour			
	1st.foot	2nd.foot	3rd.foot	4th.foot
1	5.4	3.4	1.7	1.4
2	14.4	4.1	1.4	1.3
3	34.2	8.9	3.	1.8
4	15.6	24.7	8.2	4.1
5	12.0	28.0	9.6	5.3
6	27.7	22.0	20.8	8.6
7	8.9	20.	7.0	3.8
8	11.0	9.6	4.8	3.6
9	40.0	18.	14.4	5.0
10	27.1	53.3	20.0	9.4
11	22.3	27.5	31.6	16.6
12	17.9	32.0	26.6	15.0

TABLE 43 SOIL SALINITY AND ALKALINITY CHANGES WITH DIFFERENT TREATMENTS *

PLOT N° 13		TOTAL SALTS MEASURED BY EC BEFORE AND AFTER LEACHING WITH FREE/WATER in mmhos/cm at 25° C				PERCENT SALTS REMOVED UNDER DIFFERENT TREATMENTS					
Sub-plot	Depth	Original (0)	1st ft (1)	2nd ft (2)	(NT)	(0-1)	(0-2)	(0-NT)	(1-2)	(1-NT)	(2-NT)
A	0-30	14.2	1.14	0.71	-	73	83	-	38	-	-
	30-60	11.2	0.89	1.27	-	90	89	-	+42	-	-
	60-90	17.2	1.56	1.15	-	91	93	-	26	-	-
B	0-30	11.2	6.3	1.4	0.81	44	87	93	78	87	42
	30-60	28.9	16.8	4.7	1.13	42	84	96	72	93	76
	60-90	16.6	25.9	16.8	10.8	+56	+1	35	35	58	36
C	0-30	34.4	5.65	6.15	-	84	82	-	+8	-	-
	30-60	24.0	22.6	17.3	-	6	28	-	24	-	-
	60-90	21.7	31.2	25.6	-	+43	+17	-	18	-	-
				EXCHANGEABLE SODIUM PERCENTAGE							
A	0-30	-	11.0	4.5	-	-	-	-	59	-	-
	30-60	24	13.0	9.5	-	46	60	-	27	-	-
	60-90	40	17.0	10.0	-	57	75	-	41	-	-
B	0-30	34	20.0	9.0	8.	41	73	76	55	60	11
	30-60	90	21.0	17.5	13.	77	81	86	17	38	26
	60-90	52	25.0	18.0	25.	52	65	52	28	0	+39
C	0-30	100	25.0	19.0	-	75	81	-	24	-	-
	30-60	89	30.0	21.0	-	66	76	-	30	-	-
	60-90	66	31.0	23.0	-	53	65	-	26	-	-

* NT: New Treatment mentioned in Field Calendar.

TABLE N 44 FIELD CALENDAR OF TREATMENTS.

I PLOT Nº 13

Nº of Subplots: 3
13 A
13 B
13 C
Area of each Subplot: 133.3 m2
Area of entire Plot: 400 m2

II SEQUENCE OF FIELD OPERATIONS AND THEIR DATES.

Extraction of original samples (0)	27/2/67
Border construction, levelling, ploughing, etc.	27/2/67
First leaching with one foot water depth	30/3/67
Extraction of sample after first leaching (1)	3/4/67
Second leaching with one foot water depth	3/4/67
Extraction of sample after second leaching (2)	11/7/67

III NEW TREATMENTS (N.T.)

First leaching with one foot water depth	2/11/67
Second leaching with one foot water depth	6/11/67
Third leaching with one foot water depth	16/1/68
Fourth leaching with one foot water depth	25/1/68

EXTRACTION OF SAMPLES AFTER (N.T.) 22/3/68

IV TOTAL TIME OF FIELD OPERATIONS UNDER NATURAL WORKING CONDITIONS 13 months

TABLE 45 SOIL SALINITY AND ALKALINITY CHANGES WITH DIFFERENT TREATMENTS *

PLOT N°18		TOTAL SALTS MEASURED BY EC BEFORE AND AFTER LEACHING WITH FEEP/WATER in mmhos/cm at 25° C				PERCENT SALTS REMOVED UNDER DIFFERENT TREATMENTS					
Sub-plot	Depth	Original (0)	1st.ft (1)	2nd.ft (2)	(NT)	(0-1)	(0-2)	(0-NT)	(1-2)	(1-NT)	(2-NT)
A	0-30	-	1.32	0.93	2.5	-	-	-	29	+80	+168
	30-60	-	3.76	1.14	1.70	-	-	-	70	69	+3
	60-90	-	7.80	2.67	1.4	-	-	-	66	85	57
B	0-30	-	1.47	0.83	0.87	-	-	-	43	41	+5
	30-60	-	4.95	2.12	0.81	-	-	-	57	84	62
	60-90	-	11.20	4.95	0.87	-	-	-	56	92	82
C	0-30	8.15	1.45	0.65	0.50	82	92	94	55	66	23
	30-60	13.0	4.34	0.99	0.56	67	92	96	77	88	43
	60-90	15.50	9.70	2.48	0.64	37	84	96	74	93	74
				EXCHANGEABLE SODIUM PERCENTAGE							
A	0-30	-	7	5	4	-	-	-	30	43	20
	30-60	-	17	13	7	-	-	-	24	59	46
	60-90	-	20	14	10	-	-	-	30	50	29
B	0-30	-	8	8	4	-	-	-	0	50	50
	30-60	-	17	15	14	-	-	-	12	18	7
	60-90	-	23	25	15	-	-	-	+8	35	40
C	0-30	8.0	8	7	6	0	12	25	13	25	14
	30-60	23.7	15	9	7	37	62	70	34	53	22
	60-90	29.0	20	13	7	31	55	75	35	65	46

* NT: New Treatment mentioned in Field Calendar

TABLE No. 46 FIELD CALENDAR OF TREATMENTS.

I PLOT N° 18

N° of Subplots: 3
18 A
18 B
18 C
Area of each Subplot: 133.3 m2
Area of entire plot: 400 m2

II SEQUENCE OF FIELD OPERATIONS AND THEIR DATES.

Extraction of original samples (0)	27/2/67
Border construction, levelling, ploughing, etc.	30/3/67
First leaching with one foot water depth	3/4/67
Extraction of sample after first leaching (1)	3/5/67
Second leaching with one foot water depth	3/5/67
Extraction of sample after second leaching (2)	25/5/67

III NEW TREATMENTS (N.T.)

Gypsum application, ploughed under 29/9/67

18 A = 6075 kg/heet.
18 B = 4050 kg/heet.
18 C = 2025 kg/heet.

First leaching with one foot water depth	2/11/67
Second leaching with one foot water depth	6/11/67
Third leaching with one foot water depth	16/1/68
Fourth leaching with one foot water depth	24/1/68

EXTRACTION OF SAMPLE AFTER NEW TREATMENT 22/3/68

IV TOTAL TIME OF FIELD OPERATIONS UNDER NATURAL CONDITIONS 13 months

TABLE 47 SOIL SALINITY AND ALKALINITY CHANGES WITH DIFFERENT TREATMENTS *

PLOT N° 19		TOTAL SALTS MEASURED BY EC BEFORE AND AFTER LEACHING WITH FEET/WATER in mmhos/cm at 25° C				PERCENT SALTS REMOVED UNDER DIFFERENT TREATMENTS					
Sub-plot	Depth	Original	1st.ft	2nd.ft							
		(0)	(1)	(2)	(NT)	(0-1)	(0-2)	(0-NT)	(1-2)	(1-NT)	(2-NT)
A	0-30	1.4	0.56	2.48	1.5	60	+80	+7	+343	+168	40
	30-60	-	0.47	0.65	0.8	-	-	-	+38	+70	+23
	60-90	5.1	0.44	0.50	0.7	91	90	86	+13	+59	+40
B	0-30	3.0	1.7	1.24	2.5	43	59	17	27	+47	+101
	30-60	11.7	4.9	3.72	1.5	58	68	87	24	69	60
	60-90	11.4	8.7	7.0	2.8	24	39	75	20	67	60
C	0-30	10.4	8.5	0.7	0.8	18	93	92	92	91	+14
	30-60	24.9	3.0	1.0	0.8	87	96	97	67	73	20
	60-90	15	18.0	3.7	9.3	+20	75	38	79	48	+151
				EXCHANGEABLE SODIUM PERCENTAGE							
A	0-30	3	3	5	0.2	0	+66	93	+66	93	96
	30-60	2	2.5	3	2.0	+25	+50	0	+20	20	34
	60-90	4.5	5	4	2.0	+11	11	56	20	60	50
B	0-30	-	10	7	8	-	-	-	30	20	+14
	30-60	22	18	13	10	18	41	55	28	44	23
	60-90	29	23	22	21	20	24	28	4	9	5
C	0-30	13	18	8	10	+38	38	23	56	44	+25
	30-60	46	15	9	6	67	80	87	40	60	33
	60-90	-	22	15	18	-	-	-	32	18	+20

* NT: New Treatment mentioned in Field Calendar

Table No48 FIELD CALENDAR OF TREATMENTS.

I PLOT Nº 19

Nº of Subplots: 3
19 A
19 B
19 C
Area of each Subplot: 133.3 m2
Area of entire Plot: 400 m2

II SEQUENCE OF FIELD OPERATIONS AND THEIR DATES.

Extraction of original samples (0)	27/2/67
Border construction, levelling, ploughing, etc.	30/3/67
First leaching with one foot water depth	3/4/67
Extraction of sample after first leaching (1)	3/5/67
Second leaching with one foot water depth	3/5/67
Extraction of sample after second leaching (2)	25/5/67

III NEW TREATMENTS (N.T.)

Gypsum application, ploughed under 29/9/67
19 A = 6200 tons/hect.
19 B = 4800 tons/hect.
19 C = 2400 tons/hect.

First leaching with one foot water depth	2/11/67
Second leaching with one foot water depth	6/11/67
Third leaching with one foot water depth	16/1/68

EXTRACTION OF SAMPLES AFTER (N.T.) 22/3/68

IV TOTAL TIME OF FIELD OPERATIONS UNDER NATURAL WORKING CONDITIONS 13 months

Reclamation Experiments

TABLE ..4.. SOIL SALINITY AND ALKALINITY CHANGES WITH DIFFERENT TREATMENTS*

PLOT N° 25		TOTAL SALTS MEASURED BY EC BEFORE AND AFTER LEACHING WITH FEET/WATER in mmhos/cm at 25° G			PERCENT SALTS REMOVED UNDER DIFFERENT TREATMENTS		
Sub-plot	Depth	Original (0)	lst.ft (1)	(NT)	(0-1)	(0-NT)	(1-NT)
A	0-30	17.5	23.4	10.0	+34	43	57
	30-60	29.4	26.8	23.0	9	71	15
	60-90	37.4	31.8	28	16	25	11
B	0-30	1.75	0.9	1.9	49	+9	+111
	30-60	2.79	1.0	0.7	64	75	30
	60-90	10.2	5.4	2.2	47	88	59
C	0-30	10.2	0.8	1.3	92	87	+63
	30-60	2.42	0.7	0.7	71	71	0
	60-90	4.35	0.7	0.75	84	83	7
		EXCHANGEABLE SODIUM PERCENTAGE					
A	0-30	32	40	25	+25	22	37
	30-60	32	40	32	+25	0	23
	60-90	28	40	29	+43	+4	27
B	0-30	8	10	2	+25	75	80
	30-60	13	30	3	+130	77	90
	60-90	20	27	19	+35	5	30
C	0-30	12	7	3	42	75	57
	30-60	13	10	7	23	46	30
	60-90	17	13	15	24	12	+16

* NT: New Treatment mentioned in Field Calendar

TABLE Nº 50

FIELD CALENDAR OF TREATMENTS.

I PLOT Nº 25

Nº of Subplots: 3
25 A
25 B
25 C
Area of each Subplot: 133.3 m2
Area of entire Plot: 400 m2

II SEQUENCE OF FIELD OPERATIONS AND THEIR DATES.

Extraction of original samples (0)	13/4/67
Border construction, levelling, ploughing, etc.	20/4/67
First leaching with one foot water depth	24/4/67
Extraction of sample after first leaching (1)	11/8/67

III NEW TREATMENTS (N.T.)

Gypsum application and ploughing under 28/9/67

25 A = 3600 tons/hect.
25 B = 2400 tons/hect.
25 C = 1200 tons/hect.

First leaching with one foot water deph	7/10/67
Second leaching with one foot water depth	8/11/67

EXTRACTION OF SAMPLES AFTTER NEW TREATMENT 22/3/68

IV TOTAL TIME OF FIELD OPERATIONS UNDER NATURAL CONDITIONS 11 months 9 days

TABLE 51 SOIL SALINITY AND ALKALINITY CHANGES WITH DIFFERENT TREATMENTS*

PLOT N° 26		TOTAL SALTS MEASURED BY EC BEFORE AND AFTER LEACHING WITH FEET/WATER in mmhos/cm at 25° C				PERCENT SALTS REMOVED UNDER DIFFERENT TREATMENTS		
Sub-plot	Depth	Original (0)	(1)	(2)	(NT)	(0-1)	(0-NT)	(1-NT)
A	0-30	37.4	4.6	-	4.5	88	88	2
	30-60	29.4	17.5	-	8.3	40	72	53
	60-90	31.1	33.4	-	18.5	+7	40	45
B	0-30	1.94	1.55	-	0.7	20	64	55
	30-60	8.04	1.8	-	0.8	88	90	56
	60-90	12.3	3.8	-	0.9	69	93	76
C	0-30	0.9	0.6	-	0.6	33	33	0
	30-60	2.6	0.8	-	0.7	69	73	12
	60-90	8.0	0.9	-	0.7	+13	91	22
				EXCHANGEABLE SODIUM PERCENTAGE				
A	0-30	24	40	-	28	+67	+17	30
	30-60	24	17	-	28	29	+17	+65
	60-90	23	40	-	35	+74	+52	12
B	0-30	7	7	-	6	0	14	14
	30-60	13	13		13	0	0	0
	60-90	29	17	-	17	23	23	0
C	0-30	7	7	-	3	0	57	57
	30-60	9	13	-	8	44	11	38
	60-90	22	17	-	6	23	73	65

* NT = New Treatment mentioned in Field Calendar

TABLE 52 FIELD CALENDAR OF TREATMENTS.

I PLOT N° 26

N° of Subplots: 3
26 A
26 B
26 C

Area of each Subplot: 133.3 m2
Area of entire plot: 400 m2

II SEQUENCE OF FIELD OPERATIONS AND THEIR DATES.

Extraction of original samples (0)	13/4/67
Border construction, levelling, ploughing, etc.	20/4/67
First leaching with one foot water depth	24/4/67
Extraction of samples after first leaching (1)	11/8/67

III NEW TREATMENTS (N.T.)

Gypsum application, ploughed under 29/9/67
26 A = 5400 tons/hect.
26 B = 3600 tons/hect.
26 C = 1800 tons/hect.

First leaching with one foot water depth 7/11/67

EXTRACTION OF SAMPLE AFTER NEW TREATMENT 22/3/68

IV TOTAL TIME OF FIELD OPERATIONS UNDER NATURAL CONDITIONS 11 months 9 days

TABLE 53 SOIL SALINITY AND ALKALINITY CHANGES WITH DIFFRENT TREATMENTS

PLOT N° 27		TOTAL SALTS MEASURED BY EC BEFORE AND AFTER LEACHING WITH FEET/WATER in mmhos/cm at 25° C			PERCENT SALTS REMOVED UNDER DIFFERENT TREATMENTS		
Sub-plot	Depth	Original (0)	1st ft (1)	(NT)	(0-1)	(0-NT)	(1-NT)
A	0-30	18.1	9.2	-	49	-	-
	30-60	31.1	24.8	-	20	-	-
	60-90	33	33.4	-	+1	-	-
B	0-30	15	3.8	0.6	75	96	84
	30-60	23.2	10.3	0.7	56	97	93
	60-90	30.2	17.9	0.7	40	98	96
C	0-30	7.3	0.7	-	90	-	-
	30-60	19.4	0.7	-	96	-	-
	60-90	22.7	0.9	-	96	-	-
				EXCHANGEABLE SODIUM PERCENTAGE			
A	0-30	24	40	-	+67	-	-
	30-60	23	40	-	+74	-	-
	60-90	22	40	-	+82	-	-
B	0-30	15	17	4	+13	73	76
	30-60	21	40	10	+91	52	75
	60-90	23	27	14	+17	39	48
C	0-30	13	10	-	23	-	-
	30-60	19	13	-	32	-	-
	60-90	21	13	-	38	-	-

NT = New Treatment mentioned in Field Calendar

Table 54 FIELD CALENDAR OF TREATMENTS.

I PLOT N° 27

N° of Subplots: 3
27 A
27 B
27 C
Area of each Subplot: 133.3 m2
Area of entire Plot: 400 m2

II SEQUENCE OF FIELD OPERATIONS AND THEIR DATES.

Extraction of original samples (0)	13/4/67
Border construction, levelling, plough, etc.	20/4/67
First leaching with one water depth	24/4/67
Extraction of sample after first leaching (1)	11/8/67

III NEW TREATMENTS (N.T.)

Gysum application, ploughed under 28/9/67

27 A = 0.563 tons/hect.
27 B = 0.563 tons/hect.
27 C = 0.563 tons/hect.

First leaching with one foot water depth	7/11/67
Second leaching with one foot water depth	10/11/67
Third leaching with one foot water depth	18/1/68
Fourth leaching with one foot water depth	24/1/68

EXTRACTION OF SAMPLE AFTER (N.T.) 22/3/68

IV TOTAL TIME OF FIELD OPERATIONS UNDER NATURAL WORKIN CONDITIONS 11 months 9 days

TABLE 55 SOIL SALINITY AND ALKALINITY CHANGES WITH DIFFERENT TREATMENTS *

PLOT N° 28		TOTAL SALTS MEASURED BY EC BEFORE AND AFTER LEACHING WITH FEET/WATER in mmhos/cm at 25° C				PERCENT SALTS REMOVED UNDER DIFFERENT TREATMENTS		
Sub-plot	Depth	Original (0)	1st ft (1)	2nd ft (2)	(NT)	(0-1)	(0-NT)	(1-NT)
A	0-30	36	4.9	-	-	86	-	-
	30-60	25.7	20.3	-	-	21	-	-
	60-90	16.6	31.1	-	-	+87	-	-
B	0-30	9.5	2.0	-	0.9	79	90	55
	30-60	17.0	7.2	-	2.0	58	88	72
	60-90	24.6	14.9	-	8.0	38	67	46
C	0-30	7.5	.6	-	-	92	-	-
	30-60	14.3	3.5	-	-	75	-	-
	60-90	17.0	.9	-	-	95	-	-
		EXCHANGEABLE SODIUM PERCENTAGE						
A	0-30	22	23	-	-	+6	-	-
	30-60	22	40	-	-	+82	-	-
	60-90	25	40	-	-	+60	-	-
B	0-30	18	40	-	14	+122	22	65
	30-60	21	40	-	23	+91	+10	42
	60-90	32	40	-	22	+25	31	45
C	0-30	12	13	-	-	+8	-	-
	30-60	21	23	-	-	+10	-	-
	60-90	23	17	-	-	+26	-	-

* NT = New Treatment mentioned in Field Calendar

TABLE 56 FIELD CALENDAR OF TREATMENTS.

I PLOT Nº 28

Nº of Subplots: 3
28 A
28 B
28 C

Area of each Subplot: 133.3 m2
Area of entire Plot: 400 m2

II SEQUENCE OF FIELD OPERATIONS AND THEIR DATES.

Extraction of original samples (0)	13/4/67
Border construction, levelling, ploughing, etc.	15/7/67
First leaching with one foot water depth	19/7/69
Extraction of sample after first leaching (1)	11/8/67

III NEW TREATMENTS (N.T.)

Gypsum application, ploughed under	28/9/67
28 A = 0.750 tons/hect.	
28 B = 0.750 tons/hect.	
28 C = 0.750 tons/hect.	
First leaching with one foot water depth	7/11/67
Second leaching with one foot water depth	10/11/67
Third leaching with one foot water depth	18/1/67
EXTRACTION OF SAMPLE AFTER NEW TREATMENT	22/3/68

IV TOTAL TIME OF FIELD OPERATIONS UNDER NATURAL CONDITIONS 11 months 9 days

TABLE 57 SOIL SALINITY AND ALKALINITY CHANGES WITH DIFFERENT TREATMENTS *

PLOT N° 29		TOTAL SALTS MEASURED BY EC BEFORE AND AFTER LEACHING WITH FEET/WATER in mmhos/cm at 25° C				PERCENT SALTS REMOVED UNDER DIFFERENT TREATMENTS		
Sub-plot	Depth	Original (0)	1st ft (1)	2nd ft (2)	(NT)	(0-1)	(0-NT)	(1-NT)
A	0-30	14.3	5.3	-	-	63	-	-
	30-60	20.4	14.2	-	-	30	-	-
	60-90	28.5	23.4	-	-	18	-	-
B	0-30	8.0	3.2	-	1.6	60	80	50
	30-60	16.0	11.3	-	8.0	29	50	29
	60-90	19.0	17.4	-	15.0	8	21	14
C	0-30	7.5	.8	-	-	89	-	-
	30-60	15.0	7.3	-	-	51	-	-
	60-90	18.0	18.0	-	-	0	-	-
				EXCHANGEABLE SODIUM PERCENTAGE				
A	0-30	82	25	-	-	22	-	-
	30-60	40	40	-	-	0	-	-
	60-90	40	40	-	-	0	-	-
B	0-30	25	17	-	15	32	40	12
	30-60	40	40	-	20	0	50	50
	60-90	40	40	-	28	0	30	30
C	0-30	16	17	-	-	+6	-	-
	30-60	23	27	71	-	+17	-	-
	60-90	36	27	-	-	25	-	-

* NT = New Treatment mentioned in Field Calendar

TABLE 58

FIELD CALENDAR OF TREATMENTS.

I PLOT Nº 29

Nº of Subplots: 3
29 A
29 B
29 C

Area of each Subplot: 133.3 m2
Area of entire Plot: 400 m2

II SEQUENCE OF FIELD OPERATIONS AND THEIR DATES.

Extraction of original samples (0)	13/4/67
Border construction, levelling, ploughing, etc.	15/7/67
First leaching with one foot water depth	20/7/67
Extraction of sample after first leaching (1)	11/8/67

III NEW TREATMENTS (N.T.)

Gypsum application, ploughed under 29 A = 0.937 tons/hect. 29 B = 0.937 tons/hect. 29 C = 0.937 tons/hect.	29/9/67
First leaching with one foot water depth	8/11/67
Second leaching with one foot water depth	23/1/68
EXTRACTION OF SAMPLE AFTER NEW TREATMENT	22/3/68

IV TOTAL TIME OF FIELD OPERATIONS UNDER NATURAL CONDITIONS	11 months 9 days

TABLE 99 SOIL SALINITY AND ALKALINITY CHANGES WITH DIFFERENT TREATMENTS *

PLOT N° 30		TOTAL SALTS MEASURED BY EC BEFORE AND AFTER LEACHING WITH FEED/WATER in mmhos/cm at 25° C				PERCENT SALTS REMOVED UNDER DIFFERENT TREATMENTS		
Sub-plot	Depth	Original (0)	1st ft (1)	2nd ft (2)	(NT)	(0-1)	(0-NT)	(1-NT)
A	0-30	7.1	1.44	-	-	80	-	-
	30-60	14.4	8.7	-	-	40	-	-
	60-90	20.9	14.0	-	-	33	-	-
B	0-30	19.1	23.5	-	5.7	+23	70	76
	30-60	25.3	31.2	-	20.0	+23	21	36
	60-90	27	33.8	-	30.0	+25	+11	11
C	0-30	11.9	1.2	-	-	90	-	-
	30-60	16.1	1.2	-	-	92	-	-
	60-90	19.0	2.1	-	-	89	-	-
				EXCHANGEABLE SODIUM PERCENTAGE				
A	0-30	31	15	-	-	52	-	-
	30-60	40	27	-	-	32	-	-
	60-90	+40	40	-	-	0	-	-
B	0-30	+40	23	-	24	42	40	+4
	30-60	+40	40	-	37	0	7	7
	60-90	+40	40	-	40	0	0	0
C	0-30	19	13	-	-	32	-	-
	30-60	25	13	-	-	48	-	-
	60-90	30	17	-	-	43	-	-

*NT = New Treatment mentioned in Field Calendar

TABLE 60 FIELD CALENDAR OF TREATMENTS.

I PLOT Nº 30

Nº of Subplots: 3
30 A
30 B
30 C

Area of each Subplot: 133.3 m2
Area of entire Plot: 400 m2

II SEQUENCE OF FIELD OPERATIONS AND THEIR DATES.

Extraction of original samples (0)	13/4/67
Border construction, levelling, ploughing, etc.	20/7/67
First leaching with one foot water depth	24/7/67
Extraction of sample after first leaching (1)	11/8/67

III NEW TREATMENTS (N.T.)

Gypsum application, ploughed under 30 A = 0.900 tons/hect. 30 B = 0.900 tons/hect. 30 C = 0.900 tons/hect.	28/9/67
First leaching with one foot water depth	8/11/67
EXTRACTION OF SAMPLE AFTER NEW TREATMENT	22/3/68

IV TOTAL TIME OF FIELD OPERATIONS UNDER NATURAL CONDITIONS 11 months 9 days

TABLE 61 SOIL SALINITY AND ALKALINITY CHANGES WITH DIFFERENT TREATMENTS *

PLOT N° 31		TOTAL SALTS MEASURED BY EC BEFORE AND AFTER LEACHING WITH FREE/WATER in mmhos/cm at 25° C				PERCENT SALTS REMOVED UNDER DIFFERENT TREATMENTS		
Sub-plot	Depth	Original (0)	1st ft (1)	2nd ft (2)	(NT)	(0-1)	(0-NT)	(1-NT)
A	0-30	2.46	0.75	-	-	69	-	-
	30-60	6.32	0.58	-	-	91	-	-
	60-90	8.70	0.81	-	-	91	-	-
B -	0-30	11.8	3.9	-	6.35	66	46	+63
	30-60	17.8	11.0	-	16.9	38	5	+54
	60-90	21.5	19.4	-	25.3	10	+18	+30
C	0-30	15.8	0.68	-	-	96	-	-
	30-60	25.6	0.75	-	-	97	-	-
	60-90	28.2	1.1	-	-	96	-	-
				EXCHANGEABLE SODIUM PERCENTAGE				
A	0-30	7	7	-	-	0	-	-
	30-60	14	7	-	-	50	-	-
	60-90	27	13	-	-	52	-	-
B	0-30	29	20	-	31	31	+7	+55
	30-60	40	40	-	35	0	12	12
	60-90	40	40	-	42	0	+5	+5
C	0-30	17	13	-	-	20	-	-
	30-60	23	15	-	-	35	-	-
	60-90	34	17	-	-	60	-	-

* NT = New Treatment mentioned in Field Calender