SOIL SALINITY MODELING UNDER SHALLOW WATER TABLE CONDITIONS

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1987

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1991

Submitted to the Faculty of the
Graduate College of the
Oklahoma State University
in partial fulfillment of
the requirements for
the degree of
DOCTOR OF PHILOSOPHY
December, 1993

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WATER TABLE CONDITIONS

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ACKNOWLEDGMENTS

I wish to express my sincere gratitude to Dr. Ronald L. Elliott, my major professor, for his valuable input, timely and thoughtful guidance, advice, and suggestions and for reading many rough drafts. My sincere thanks and acknowledgments to my graduate committee members Dr. G. O. Brown, Associate Professor; Dr. N. T. Basta, Assistant Professor; and Dr. C. T. Haan, Regents Professor. Their timely guidance and support is highly appreciated.

I am very thankful to Dr. J. E. Ayars, USDA-ARS, WMRL, Fresno, California for the supply of field data, his valuable input, guidance and suggestions during my visit to Fresno, and his assistance from time to time over the phone. Without this field data, the study would have been incomplete.

My special appreciation and thanks to Dr. R. L. Elliott, Professor and my advisor; Dr. Bill Barfield, Department Head; and Annette Barfield (wife of Department Head) for their moral support and encouragement during crucial times when my wife was sick. Without their support it would not have been possible for me to continue and complete this study.

Financial support from the Ministry of Education, Government of Pakistan for the entire period of 4 years was greatly appreciated. Without this support I would not have even started M.S. and Ph.D. studies. Many thanks to the

Education Attache, Education Division, Embassy of Pakistan, Washington D. C. for guidance and very prompt response in every matter.

I am grateful to the Department of Agricultural Engineering for providing me with a graduate research assistantship which made my degree program possible.

I loved the knowledgeable conversations with my fellow students at the Department of Agricultural Engineering. The list would not be complete without acknowledging Kareta Casey and Art Greene for their valuable input in preparing this document.

I especially wish to express my gratitude towards my parents. Their encouragement and guidance made this task possible. I am very much indebted to my wife Shama Riasat and sons Wahab Ali and M. S. Sadiq for their support, encouragement and patience. During my wife's illness, her encouragement to complete this degree while away from her is especially appreciated.

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CHAPTER I

INTRODUCTION

Statement of the Problem

Soil salinity is one of the major factors affecting agricultural production. The dual problems of soil salinity and a shallow water table exist in many countries of the world. More than 50% of all irrigated lands in the world are affected by secondary salinization, sodication and/or water logging (Massoud, 1976). Salt affected soils in Europe are estimated to total over 27 million hectares. In the Netherlands, excess water is removed with the help of drainage during the spring, and during the summer upward flux from a shallow water table is utilized for plant growth (Raats and Gardner, 1974). There are reports of several thousand hectares being underlain by shallow ground water in the United States.

Pakistan, which ranks fifth in the world and third among developing countries in irrigated area, is currently suffering severely from the effects of soil salinity and a shallow water table. Soil salinity can adversely affect crop production and the hydraulic properties of soils. Build up of cations and anions in excess amounts can increase the osmotic potential which reduces the ability of roots to extract water from the soil. Specific ion toxicity also plays a role in affecting crops. Excess sodium can lead to significant reductions in soil hydraulic conductivity. Immediate attention is required because agriculture provides the livelihood for over 50 percent of Pakistan's 110 million population and is one of the most productive sectors of the economy. Many other countries around the globe are also experiencing similar problems.

The major potential sources of soil salinity are: the soil itself, precipitation and irrigation water, fertilizers, pesticides, industrial wastes, seepage, and a shallow water table. In mature soils, natural changes in salt content are insignificant. As a result of weathering and chemical reactions, a comparatively new soil may contain or produce salts which are harmful for plant growth. The change in salt content of this type of soil depends on composition, development stage, and management.

Salt concentrations in rain water and snow are usually insignificant except in regions close to coastal areas. In arid regions, soil salinity tends to increase unless excess irrigation water is available for leaching. When the amount of irrigation water applied is not sufficient to meet the leaching requirements, or when the drainage system is inadequate, salts in the irrigation water accumulate in the root zone. So irrigation water, depending on its quality, can be one of the major contributors to soil salinity.

Application of fertilizers, pesticides, and industrial wastes may contribute to soil salinity. Application rate and timing, soil water content, and precipitation and irrigation patterns affect the distribution of fertilizers and their subsequent leaching and availability to plants.

A shallow water table if present may be nonsaline or saline. The presence of a nonsaline shallow water table may be beneficial in that the upward capillary flux from it can help to meet crop water needs. Nimah and Hanks (1973) found that a water table 2.0 m below the soil surface can make significant contributions to the water needs of alfalfa. They also observed that there is a direct relationship between the rooting depth of the crop and the amount of upward capillary flux. Childs and Hanks (1975) found that the contribution from a shallow water table can be small or large depending upon the physical characteristics of the soil, water table depth, and rooting depth of the crop. Wesseling and van Wijk (1957) concluded that the amount of water supplied to the roots from upward capillary rise is small and not more than a few centimeters during the growing season. Saini and Childyal (1977) showed that upward flux from a shallow water table can contribute 36 to 73% of the total water requirements of winter wheat.

However the presence of a saline shallow water table can be another major source of soil salinity if upward flux to the root zone area is sufficient. Salts are left in the root zone as a result of evapotranspiration and can adversely affect the soil structure and limit plant growth. Experiments conducted by Chaudhary et al. (1974), for quantification of crop response to depth and salinity of ground water, indicated that the critical depth of water table which should be maintained for optimum crop production depends on its salinity level. Kruse et al. (1993), in a lysimeter study, concluded that irrigation amounts can be reduced by about two-thirds and one-fourths if a water table is present at 0.6 and 1.05 m, respectively. They grew corn and wheat on a fine sandy loam soil under semi-arid climatic conditions. Water table salinity level had only a minor effect on groundwater utilization by corn but had a major influence when the water table was at 1.05 m in the case of wheat. Seasonal water use by cotton, from a shallow water table, is reduced as the salinity level of the capillary zone is increased (Namken et al., 1969). However Ayars and Schoneman (1986) showed that considerable quantities of water can be extracted by cotton from a saline perched water table.

The transport of salts from a saline shallow water table in excess amounts can suppress the conditions favorable for plant growth and yield. If the root zone salinity reaches a level which is above the threshold for that crop, then yield is affected (Bajwa et al., 1986; Francois et al., 1986; Maas and Hoffman, 1977, van Genuchten, 1983; van Genuchten and Hoffman, 1984). The study of salinity accumulation in the root zone due to upward capillary flux from a saline shallow water table may suggest appropriate remedial measures. Since excessive soil salinity can destroy crops and make productive land completely infertile, it becomes important to quantify the rate of salt accumulation in the root zone.

In order to estimate the contribution of a shallow water table to soil salinization and crop water needs, it is necessary to quantify the evapotranspiration (ET) requirements, the hydraulic characteristics of the soil, the rate of water extraction by roots, and solute transport and chemical equilibrium processes. Selection and use of a model including all of these components could lead to recommendations on appropriate remedial measures. This model can be applied to find the relationship between the depth of a saline shallow water table and the upward movement and accumulation of salts in the soil surface.

Model applications could include: (1) examining, for various water table depths, the tradeoffs between salt accumulation in the soil profile and water table contributions to crop water requirements; (2) suggesting the proper depth for installing subsurface drains; (3) evaluating the degree of salinity risk to various crops; and identifying the preferred irrigation management strategy for minimizing salinity effects.

Research Objectives

The overall objective of this study is to model the salinity in the soil surface layer (root zone), particularly as it is affected by crop use of saline water from a shallow water table. This can be accomplished with a soil salinity model which integrates various important processes/submodels including evapotranspiration, unsaturated flow, root extraction, solute transport, and chemical equilibrium processes.

The first task is to select an appropriate existing soil salinity model and test its performance under saline shallow water table conditions. The second task is to apply this model in analyzing problems related to soil salinity. Three such applications are envisioned: (1) evaluating various water table depths and salinity levels in terms of salt accumulation in the root zone and contribution to crop-water use; (2) examining the impact of various irrigation strategies on the accumulation of salts in the root zone and on crop yield; and (3) evaluating the influence of soil type and crop type on root zone salinity.

CHAPTER II

THEORY AND LITERATURE REVIEW

Water and Solute Transport in Unsaturated Soil: Fundamental Theory

Soil Water Transport

Unsaturated Flow

Soil water, like other constituents in nature, follows the path of least resistance in its effort to reach equilibrium. Water moves in soil from a point where its energy is relatively high to another point where its energy is relatively low. Water can move in soil in several directions and forms in response to differences in energy potential. The sum of the pressure and gravitational potentials is usually taken as the total potential, although osmotic potential is sometimes considered as well. The relative magnitudes of total potential at two points in a soil determine the direction of water flow.

The pressure potential is considered positive if it is greater than atmospheric pressure. A negative pressure potential is sometimes termed a matric potential. The pressure potential of a mass (M) of water occupying a volume (V) is given as (Hillel, 1980):

$$\phi_p = Mgh \tag{1}$$

or

$$\phi_p = \rho_w Vgh \tag{2}$$

where (ϕ_p) is the pressure potential (FL); g is acceleration due to gravity (LT^{-2}); ρ_w is the density of water (ML^{-3}); and h is the depth below the free water surface (L). The expression for pressure potential per unit weight becomes:

$$\frac{\phi_p}{\gamma V} = h \tag{3}$$

where γ is the unit weight of water (FL^{-3}). Similarly gravitational potential (determined by the elevation of the point relative to some arbitrary reference level) can be expressed on a unit weight basis as:

$$\frac{\phi_g}{\gamma V} = z \tag{4}$$

where ϕ_g is gravitational potential (FL) and z represents the height of the point above some reference level (L). The gravitational potential is only applicable for flow in the vertical direction. Total potential energy (H) per unit weight can therefore be given as:

$$H=h+z \tag{5}$$

This total potential energy, also called hydraulic head, is the principal driving force for soil water flow or movement. This potential energy concept is used in the flux equation known as Darcy's law, which for dilute and incompressible solution flow in the vertical direction can be expressed as:

$$q=-\frac{k\rho g}{\mu}\frac{\partial}{\partial z}(h+z) \tag{6}$$

where q is the volume rate of vertical flow per unit area, per unit time (LT^{-1}); k is the soil permeability (L^2); and μ is the dynamic viscosity (FTL^{-2}). Other terms are the same as defined above. The terms outside the parentheses on the right side of equation 6 are usually replaced by a single term called soil hydraulic conductivity (K). The flux equation for soil water flow on a macroscopic scale therefore becomes:

$$q=-K\frac{\partial}{\partial z}(h+z)=-K\nabla H \tag{7}$$

The application of Darcy's law to porous media assumes that the geometry effects are linear and tortuosity effects are ignorable.

The continuity principle, which applies the concept of conservation of mass to a small volume element of soil, states that the rate of water inflow into a small volume element minus the rate of outflow from that element is equal to the rate of change of water content in the element. Mathematically, the continuity equation can be expressed in one dimension as:

$$\frac{\partial \theta}{\partial t} = -\frac{\partial q}{\partial z} \tag{8}$$

where Θ is the volumetric soil water content; t is time; z is distance; and q is the Darcy flux as described earlier.

Substitution of Darcy's law in the above equation of continuity (8) results in the classical Richard's equation for unsaturated flow (Bresler et al., 1982):

$$\frac{\partial \theta}{\partial t} = \frac{\partial}{\partial z}[K(\theta)\frac{\partial}{\partial z}(h+z)] \tag{9}$$

This equation can also be expressed in terms of pressure potential instead of water content:

$$c(\theta)\frac{\partial h}{\partial t}=\frac{\partial}{\partial z}[K(\theta)\frac{\partial}{\partial z}(h+z)] \quad \textbf{(10)}$$

where the water capacity, $c(\Theta)$, is defined as:

$$c(\theta)=\frac{\partial\theta}{\partial h} \quad \textbf{(11)}$$

Accurate quantification of hydraulic conductivity, $K(\Theta)$, is important in the application of equations 9 or 10. Many factors affect hydraulic conductivity including soil physical properties, soil moisture, and salt content and composition. A variety of empirical and semi-empirical expressions exist for approximating the transport coefficient K and its relation to h and/or Θ (Campbell, 1974; Campbell, 1985; Hutson and Cass, 1987; Wagenet and Addiscott, 1987; van Genuchten, 1980). These relations do not include the effects of content and composition of salts on K. Many researchers have studied the effects of exchangeable sodium percentage (ESP) and electrolyte concentration on the hydraulic conductivity of various soils (Felhendler et al., 1974; Frenkel et al., 1978; McNeal and Coleman, 1966; Shainberg et al., 1981; Yaron and Shainberg, 1973; Yaron and Thomas, 1968). These studies indicate that ESP can have a strong effect on K.

Equation 10 in one form or another is used in most unsaturated soil water and solute transport models (with or without a sink term). If included, the sink term normally represents water extraction by plant roots (Nimah and Hanks, 1973):

$$\frac{\partial\theta}{\partial t}=\frac{\partial}{\partial z}[K(\theta)\frac{\partial}{\partial z}(h+z)]+A(z,t) \qquad \textbf{(12)}$$

where A(z,t) is the root extraction term (sink term). All other terms are the same as defined above.

Root Extraction

Plant roots tend to be distributed unevenly in a soil profile, and water extraction from a zone is generally related to the proportional rooting density in that zone. To estimate water uptake for a growing crop, it becomes necessary to predict with time, both the overall root depth and the proportion of the total roots in each zone. Water uptake depends not only on the amount of roots in the zone but also on the soil water content. It is known that plants can extract more water from a zone of high soil moisture availability than a drier zone (Lawlor, 1973). Root growth and water uptake are influenced by a complex interaction of crop, soil, and atmospheric conditions. Water uptake rate by plant roots can be determined by applying potential flow theory which states that under steady state conditions the rate of flow of water through a plant part is directly proportional to potential difference across that part and inversely proportional to the water flow resistance. But it is very difficult to quantify potential gradients and resistances. Researchers have been able to develop empirical and semi-empirical relations to quantify the root growth and water extraction rates of plants (Cowan, 1965; Nimah and Hanks, 1973; Rowse et al., 1978; van Bavel, 1974; Whisler et al., 1968).

Solute Transport in Unsaturated Soil

In the case of simultaneous movement of solute and water, it is usually assumed that the transport of solute is governed by convection and hydrodynamic dispersion. Convection refers to solute movement due to the bulk motion of flowing fluid. Hydrodynamic dispersion is comprised of two processes: (a) molecular diffusion; and (b) mechanical dispersion. Molecular diffusion is due to thermal kinetic energy where the solute moves in response to concentration gradients. Mechanical dispersion is the mixing of solute in response to variations in velocity within a porous medium. The relative contributions of molecular diffusion and mechanical dispersion to total hydrodynamic dispersion depend on the average fluid velocity through the porous medium.

Total solute flux is obtained by adding together convective flux, diffusive flux, and flux due to mechanical dispersion (Wagenet, 1984):

$$q_s = v\theta c - D_e(\theta)\frac{dc}{dz} - \theta D_m(v)\frac{dc}{dz} \quad \textbf{(13)}$$

or

$$q_s = v\theta c - [D_e(\theta) + \theta D_m(v)]\frac{dc}{dz} \quad \textbf{(14)}$$

where q_s is the flux of solute in the z direction ($ML^{-2}T^{-1}$); v is the average pore velocity (LT^{-1}); Θ is volumetric water content(L^3L^{-3}); c is the concentration of solute in solution (ML^{-3}); $D_e(\Theta)$ is the effective diffusion coefficient (L^2T^{-1}); and $D_m(v)$ is the mechanical dispersion coefficient (L^2T^{-1}). Generally the effects of both molecular diffusion and mechanical dispersion are combined into one term called the coefficient of hydrodynamic dispersion ($D(\Theta,v)$). If $D(\Theta,v)$ is substituted into equation 14, the resulting expression becomes:

$$q_s = -\theta D(\theta,v)\frac{dc}{dz} + q_w c \quad \textbf{(15)}$$

where q_w is the water flux (determined as $q_w = v\Theta$).

The continuity equation for solute transport states that the rate of change of solute within a finite volume element must equal the difference between the amounts of solute that enter and leave the element, expressed mathematically as:

$$\frac{\partial(\theta c)}{\partial t} = -\frac{\partial q_s}{\partial z} \tag{16}$$

Substitution of the expression for q_s (equation 15) in this equation gives:

$$\frac{\partial(\theta c)}{\partial t} = \frac{\partial}{\partial z}[\theta D(\theta,v)\frac{\partial c}{\partial z} - q_w c] \tag{17}$$

Chemical equilibrium processes such as ion-soil interactions (cation adsorption) and solute sinks or sources (precipitation-dissolution) also affect the fate of salts in the soil.

Chemical Equilibrium Processes

CO_2 System

The important chemical reactions in soil are carbonate reactions. Soils must be considered as open systems with respect to carbonates, because CO_2(g) can move from the soil to the atmosphere and return to precipitate minerals.

Carbon dioxide dissolves in water to form undissociated carbonic acid ($H_2CO^0_3$). Carbon dioxide solubility in water at 25^0C can be given as (Lindsay, 1979):

$$CO_2(g)+H_2O \rightleftharpoons H_2CO_3^0 \quad (18)$$

$$K_H=\frac{H_2CO_3}{P_{CO_2}} \quad (19)$$

$$H_2CO_3 \rightleftharpoons H^+ + HCO_3^- \quad (20)$$

$$K_{a1}=\frac{(H^+)(HCO_3^-)}{(H_2CO_3)} \quad (21)$$

where K_H is the Henry's law constant for CO_2; P_{CO2} is the partial pressure of CO_2 in the soil's atmosphere; and K_{a1} is the dissociation constant for H_2CO_3 (equation 20). The chemical equilibrium governing HCO^-_3 is:

$$HCO_3^- \rightleftharpoons H^+ + CO_3^{2-} \quad (22)$$

$$K_{a2}=\frac{(H^+)(CO_3^{2-})}{(HCO_3^-)} \quad (23)$$

where K_{a2} is the second dissociation constant for H_2CO_3. Combining equations 19, 21, and 23, produces,

$$P_{CO_2}=\frac{(H^+)^2(CO_3^{2-})}{K_H K_{a1} K_{a2}} \tag{24}$$

or

$$(CO_3^{2-})=\frac{K_H K_{a1} K_{a2} P_{CO_2}}{(H^+)^2} \tag{25}$$

The above equation (25) can be used to determine CO_3^{2-} in soil solution.

Salt Precipitation and Dissolution

The chemistry of soil is much more complex than can be described by precipitation, adsorption, or exchange processes. There are several factors which contribute to this complexity including the time scales of chemical reactions, the extent and distribution of pores and mobility of soil water, the dissolution of native and reprecipitated soil constituents by percolating water, the formation of soluble complex molecules, etc. Carbonate and sulphate minerals are considerably more soluble than most primary minerals.

Precipitation and dissolution of calcium carbonate and gypsum are generally described in terms of equilibrium relationships. The solubility product of $CaCO_3$ is defined as:

$$CaCO_3=Ca^{2+}+CO_3^{2-} \tag{26}$$

$$K_{sp1} = \frac{(Ca^{2+})(CO_3^{2-})}{CaCO_3} \tag{27}$$

where K_{sp1} is the solubility product of $CaCO_3$. If it is assumed that the activity of the solid phase ($CaCO_3$) is equal to unity, the above expression becomes:

$$K_{sp1} = (Ca^{2+})(CO_3^{2-}) \tag{28}$$

If this is substituted into equation (24), the resulting equation can be expressed as:

$$P_{CO_2} = \frac{(H^+)^2 K_{sp1}}{K_H K_{a1} K_{a2} (Ca^{2+})} \tag{29}$$

Similarly the solubility product of gypsum can be expressed as:

$$K_{sp2} = (Ca^{2+})(SO_4^{2-}) \tag{30}$$

where K_{sp2} is the solubility product of gypsum. When the product of calcium and carbonate activities is larger than its solubility product, $CaCO_3$ will precipitate. Otherwise it will dissolve. The same is true for $CaSO_4$.

Difficulties with this approach include the uncertainty of the exact species controlling the equilibria (differences in solubility products of different minerals having the same chemical formula), ability of various forms to precipitate (kinetics), and the presence of other soluble ions. The solubility products also change as the crystal grows in size (Bohn et al., 1985). Similarly impurities in the solids alter their solubility product. The presence of ion-pairs in the soil solution can have a large influence on apparent mineral solubilities.

Activity Coefficients and Ionic Pairing

The activity coefficient for an ion is defined as the ratio of its activity to its concentration in a solution. The activity coefficient of a single ion can be estimated by using either the Debye-Huckel equation or the Davies equation. The Debye-Huckel equation can be described as (Adams, 1971):

$$-Log\gamma_i = \frac{Az_i^2 I^{\frac{1}{2}}}{1 + Ba_i I^{\frac{1}{2}}} \qquad (31)$$

where γ_i is the activity coefficient for ion i; I is the ionic strength; z_i is the valence of the ion; A and B are parameters associated with the absolute temperature and dielectric constant of the solvent; and a_i is an ion-size parameter for each ion.

The Davies expression can be written as (Bohn et al., 1985):

$$-Log\gamma_i = Az_i^2 \frac{I^{\frac{1}{2}}}{1+I^{\frac{1}{2}}} - 0.3I \qquad (32)$$

where γ_i, A, z_i, and I are as defined above. The ionic strength (I) in the above expressions can be determined by (Adams, 1971):

$$I = \frac{1}{2}\sum C_i z_i^2 \qquad (33)$$

where C_i is the concentration of species i with valence z_i. The determination of ionic strength with this equation requires total chemical analysis. Researchers have been able to derive simple relations which do not require this analysis, because there exists a linear relation between electrical conductivity of a solution and its ionic strength. Ponnamperuma et al. (1966) derived an expression for the relation between ionic strength and electrical conductivity (EC). They used extracts of flooded soils. The ionic strength of electrolytic solutions was less than 0.06 mole/liter. Their expression can be given as:

$$I=0.016EC \qquad (34)$$

where I is the ionic strength (mole/liter) and EC is the electrical conductivity (mmhos/cm).

Due to the existence of neutral ion pairs and ion-pairs of reduced charge the ionic strength is usually decreased. The relationship derived by Ponnamperuma et al. (1966) was corrected for ion-pair formation by Griffin and Jurinak (1973):

$$I=0.013EC \qquad (35)$$

Whenever a molecular unit, such as an ion, acts as a central group to attract and form a close association with other atoms or molecules, it is termed a complex. If the central group and ligands in a complex are in direct contact, it is called inner-sphere. On the other hand if one or more water molecules is interposed between the central group and a ligand, it is called outer-sphere (Sposito, 1989). In concentrated salt solutions, a large fraction of cations and anions form outer-sphere complexes (water of hydration that is not shared). These outer-sphere complexes are also called "ion-pairs". The ion-pair will be uncharged if the ions are of equal but opposite charge. On the other hand, the ion pair will have a charge if the ions are of unequal charge. The extent of free ions association in solution is usually expressed by the traditional method for presenting the dissociation of weak electrolytes. For example, the dissociation reaction for the ion-pair $CaSO^0_4$ can be written as (Adams, 1971):

$$CaSO_4^0 = Ca^{2+} + SO_4^{2-} \tag{36}$$

and

$$k = \frac{(Ca^{2+})(SO_4^{2-})}{(CaSO_4^0)} \tag{37}$$

where (Ca^{2+}) and (SO_4^{2-}) are the activities of the respective ions; and k is the stability constant. The activity coefficient of the ion-pair $CaSO^0_4$ is usually assumed to be unity. The equilibrium constants for several ion-pairs in aqueous solution at 25^0C and extrapolated to zero ionic strength are given by Adams (1971). Ion-pairing of common soil-solution cations and anions generally obeys the principles as presented in Table 1 (Adams, 1971).

The significant ion-pairs in salt-affected soils are: $CaSO_4^0$, $CaCO_3^0$, $CaHCO_3^+$, $CaOH^+$, $MgCO_3^0$, $MgSO_4^0$, $MgHCO_3^+$, $MgOH^+$, $NaSO_4^-$, and $NaCO_3^-$. Considering the existence of ion-pairs, the total concentration (Ca_T) of Ca in solution can be given as:

$$Ca_T=[Ca^{+}]+[CaHCO_3^{+}]+[CaOH^{+}]+[CaCO_3^0]+[CaSO_4^0] \quad (38)$$

TABLE 1

IONIC-PAIRING PRINCIPLES OF COMMON SOIL-SOLUTION CATIONS AND ANIONS

Ion	Univalent cations	Multivalent cations
Cl^-	nil	nil
NO_3^-	small	small
SO_4^{2-}	slight	extensive
$H_2PO_4^-$ or HPO_4^{2-}	ignorable	significant
HCO_3^-	not significant	significant at high pH

Using the concept of activity coefficients, equation 38 can be written as:

$$Ca_T=[\frac{(Ca^{2+})}{\gamma_{Ca^{2+}}}+\frac{(CaHCO_3^{+})}{\gamma_{CaHCO_3}}+\frac{(CaOH^{+})}{\gamma_{CaOH}}+\frac{(CaCO_3^0)}{\gamma_{CaCO_3^0}}+\frac{(CaSO_4^0)}{\gamma_{CaSO_4^0}}] \quad (39)$$

The stability constants (K_d's) are defined as:

$$K_{d2}=\frac{(Ca^{2+})(HCO_3^-)}{(CaHCO_3^+)} \quad (40)$$

$$K_{d3}=\frac{(Ca^{2+})(OH^-)}{(CaOH^+)} \quad (41)$$

$$K_{d1}=\frac{(Ca^{2+})(CO_3^{2-})}{CaCO_3^0} \quad (42)$$

$$K_{d4}=\frac{(Ca^{2+})(SO_4^{2-})}{(CaSO_4^0)} \quad (43)$$

The activity coefficients of $CaHCO_3^+$ and $CaOH^+$ are assumed to be equal and are designated as γ_1 (Robbins et al., 1980). The activity coefficient for calcium is designated as γ_2. With the help of equations 21 and 23, $(CaHCO_3^+)$ can be expressed as:

$$(CaHCO_3^+)=\frac{(Ca^{2+})K_H K_{a1} P_{co_2}}{(H^+)K_{d2}} \quad (44)$$

or

$$[CaHCO_3^+]=\frac{(Ca^{2+})K_H K_{a1} P_{co_2}}{(H^+)K_{d2}\gamma_1} \quad (45)$$

$[CaOH^+]$ can be expressed as:

$$[CaOH^+]=\frac{(Ca^{2+})K_w}{(H^+)K_{d3}\gamma_1} \tag{46}$$

where K_w is the dissociation constant of water defined as:

$$K_w=(H^+)(OH^-) \tag{47}$$

Similarly:

$$[CaCO_3^0]=\frac{(Ca^{2+})K_H K_{a1} K_{a2}}{(H^+)^2 K_{d1}} \tag{48}$$

$$[CaSO_4^0]=\frac{(Ca^{2+})(SO_4^{2-})}{K_{d4}} \tag{49}$$

$$[Ca^{2+}]=\frac{(Ca^{2+})}{\gamma_2} \tag{50}$$

Combining the above equations (45, 46 and 48-50), one gets:

$$Ca_T=(Ca^{2+})[\frac{1}{\gamma_2}+\frac{K_{a1}K_H P_{co_2}}{(H^+)K_{d2}\gamma_1}+\frac{K_w}{(H^+)K_{d3}\gamma_1}+\frac{K_{a1}K_{a2}K_H P_{co_2}}{(H^+)^2 K_{d1}}+\frac{(SO_4^{2-})}{K_{d4}}] \tag{51}$$

or

$$(Ca^{2+})=\frac{Ca_T}{[\frac{1}{\gamma_2}+\frac{K_{a1}K_HP_{co_2}}{(H^+)K_{d2}\gamma_1}+\frac{K_w}{(H^+)K_{d3}\gamma_1}+\frac{K_{a1}K_{a2}K_HP_{Pco_2}}{(H^+)^2K_{d1}}+\frac{(SO_4^{2-})}{K_{d4}}]} \tag{52}$$

To obtain the activities of Mg^{2+}, Na^+, and SO_4^{2-}, similar procedures can be followed, resulting in the following:

$$(Mg^{2+})=\frac{Mg_T}{[\frac{1}{\gamma_2}+\frac{K_{a1}K_{a2}K_H}{(H^+)K_{d6}\gamma_1}+\frac{K_w}{(H^+)K_{d7}\gamma_1}+\frac{K_{a1}K_{a2}K_HP_{co_2}}{(H^+)^2K_{d5}}+\frac{(SO_4^{2-})}{K_{d8}}]} \tag{53}$$

$$(Na^+)=\frac{Na_T}{[\frac{1}{\gamma_1}+\frac{K_{a1}K_{a2}K_HP_{co_2}}{(H^+)^2K_{d10}\gamma_2}+\frac{(SO_4^{2-})}{K_{d9}\gamma_1}]} \tag{54}$$

$$(SO_4^{2-})=\frac{[SO_4^{2-}]}{[\frac{1}{\gamma_2}+\frac{(Mg^{2+})}{K_{d8}}+\frac{(Ca^{2+})}{K_{d4}}+\frac{(Na^+)}{K_{d9}\gamma_1}]} \tag{55}$$

where K_{d5} to K_{d10} are stability constants for $MgCO_3^0$, $MgHCO_3^+$, $MgOH^+$, $MgSO_4^+$, $NaSO_4^-$ and $NaCO_3^-$, respectively. From the above theory, it can be seen that ionic-pairing plays an important role in the determination of activities of chemical species. Various ion pairs appreciably lower the activities of free sulphate, bicarbonate, and carbonate ions.

Cation Exchange

Clay minerals and organic matter have unsatisfied negative charges which attract soil solution cations on their surfaces and are retained there in the form of small films. The retention of ions in this way reduces the loss of Ca, Mg, Na, and K by leaching. These ions can easily exchange for other cations and are therefore called exchangeable cations. The distribution of major exchangeable cations in productive agricultural soils is usually in the order: $Ca^{2+} > Mg^{2+} > K^{+} \approx Na^{+}$. The composition and cation exchange capacity varies with soil mineralogy and organic matter content in soil. The cation exchange reactions are assumed to be stoichiometric and reversible.

Cation exchange capacity (determined by sum of bases) may be expressed as:

$$CEC = Ca^{2+} + Mg^{2+} + Na^{+} + K^{+} \qquad \textbf{(56)}$$

where CEC is the cation exchange capacity. This equation (56) is only applicable when there are free salts (pH ≥ 7.1), otherwise soluble ions alone can not predict exchange composition. It is usually necessary to infer the exchangeable cation composition based on the soil solution so as to provide valuable clues about plant nutrient deficiencies, toxicity, and exchangeable sodium percentage. A number of equations have been developed for this purpose with certain limitations. Among these, the equations developed by Gapon (1933) and Vanselow (1932) are more commonly used. The exchange equations based on Gapon's convention have been used in most soil salinity models and can be given as (Sposito, 1977):

$$nmM_{1/m}X + mN^{n+} = nM^{m+} + mnN_{1/n}X \tag{57}$$

where M and N are metal cations of charges m+ and n+, respectively; and X represents cation concentration on the solid phase. The cation concentrations are given in equivalents per liter in this relation.

Using the Vanselow convention (Sposito, 1977):

$$nMX_m + mN^{n+} = nM^{m+} + mNX_n \tag{58}$$

All the terms are as defined above, but the cation concentrations are given in moles per liter.

The Gapon selectivity coefficient is used to define the equilibrium between a cation's activity in solution and its concentration in the exchange phase. Based on Gapon's convention, different selectivity coefficients can be defined:

$$K_1 = \frac{(Ca)^{\frac{1}{2}}\ X_{1/2Mg}}{(Mg)^{\frac{1}{2}}\ X_{1/2Ca}} \qquad \textbf{(59)}$$

$$K_2 = \frac{(Na)\ X_{1/2Ca}}{(Ca)^{\frac{1}{2}}\ X_{Na}} \qquad \textbf{(60)}$$

$$K_3 = \frac{(K)\ X_{1/2Ca}}{(Ca)^{\frac{1}{2}}\ X_K} \qquad \textbf{(61)}$$

$$K_4 = \frac{(K)\ X_{1/2Mg}}{(Mg)^{\frac{1}{2}}\ X_K} \qquad \textbf{(62)}$$

$$K_5 = \frac{(Na)\ X_{1/2Mg}}{(Mg)^{\frac{1}{2}}\ X_{Na}} \qquad \textbf{(63)}$$

$$K_6 = \frac{(Na)\ X_K}{(K)\ X_{Na}} \qquad \textbf{(64)}$$

The concentration of any exchangeable ion is calculated by combining the above equations (59-64) for selectivity coefficients with the expression (56) for CEC. For example, exchangeable calcium is estimated by:

$$CEC=[X_{1/2Ca}+\frac{K_1(Mg)^{\frac{1}{2}}X_{1/2Ca}}{(Ca)^{\frac{1}{2}}}+\frac{(Na)X_{1/2Ca}}{K_2(Ca)^{\frac{1}{2}}}+\frac{(K)X_{1/2Ca}}{K_3(Ca)^{\frac{1}{2}}}] \tag{65}$$

$$X_{1/2Ca}=\frac{CEC}{(1+\frac{(Mg)^{\frac{1}{2}}\ K_1}{(Ca)^{\frac{1}{2}}}+\frac{(Na)}{(Ca)^{\frac{1}{2}}\ K_2}+\frac{(K)}{(Ca)^{\frac{1}{2}}\ K_3})} \tag{66}$$

Expressions for exchangeable magnesium, sodium and potassium can be derived using the same procedure:

$$X_{1/2Mg}=\frac{CEC}{[1+\frac{(Ca)^{\frac{1}{2}}}{(Mg)^{\frac{1}{2}}K_1}+\frac{(Na)}{(Mg)^{\frac{1}{2}}K_5}+\frac{(K)}{(Mg)^{\frac{1}{2}}K_4}]} \tag{67}$$

$$X_{Na}=\frac{CEC}{[1+\frac{K_2(Ca)^{\frac{1}{2}}}{(Na)}+\frac{K_5(Mg)^{\frac{1}{2}}}{(Na)}+\frac{K_6(K)}{(Na)}]} \tag{68}$$

$$X_K = \frac{CEC}{[1 + \frac{K_3(Ca)^{\frac{1}{2}}}{(K)} + \frac{K_4(Mg)^{\frac{1}{2}}}{(K)} + \frac{(Na)}{(K)K_6}]} \qquad (69)$$

The above equations (66-69) can be used to determine the concentrations of exchangeable cations from their activities in solution and selectivity coefficients (K_i's).

Water and Solute Transport in Unsaturated Soil: Modeling Approaches

Considerable research has been conducted to model solute transport in unsaturated and saturated porous media. Many models have been developed to simulate the movement and distribution of water and solutes under various conditions, but work on validating and evaluating such models is more limited. Bresler (1981) reviewed various factors which affect transport of salts in saturated-unsaturated soil, along with the development of governing equations describing combined transient transport and miscible displacement of salts. Nielsen et al. (1986) reviewed basic processes of water flow and chemical transport in the unsaturated zone. The various deterministic mathematical models that have been used to describe these processes were also examined. Addiscott and Wagenet (1985) reviewed a number of conceptual models for solute leaching in soil and found that: (a) analytical solutions of the mechanistically-based convective-dispersive equation are sound but their deterministic nature and rigid boundary conditions limit their use; (b) spatial variability comes into the picture in the case of numerical models which are more flexible than analytical ones; (c) stochastic models account for the variability of hydraulic properties and are useful for assessing the impact of this variability; (d) functional models are less mechanistic and have modest input data requirements; and (e) the quantitative criteria used to validate models do not seem to be standardized and universally accepted.

Pennell et al. (1990) evaluated five simulation models. The models chosen for evaluation in the order of increasing complexity were: (a) Chemical Movement in Layered Soils (CMLS, Nofziger and Hornsby, 1987), (b) Method of Underground Solute Evaluation (MOUSE, Steenhuis et al., 1987), (c) Pesticide Root Zone Model (PRZM, Carsel et al., 1984), (d) Groundwater Loading Effects of Agricultural Management Systems (GLEAMS, Knisel et al., 1989), and (e) Leaching Estimation and Chemistry Model-Pesticides (LEACHP, Hutson and Wagenet, 1987). These models were used to predict the leaching of aldicarb and total carbamate residue (TCR) in a single study. Model recommendations were based on the accuracy of predictions, the amount of input data required to run the model, the form of output data, the ease of use, and model complexity. It was recommended that CMLS be used for management and teaching purposes, MOUSE as a teaching tool, and PRZM as a management tool. LEACHP was recommended for use by scientists and experienced modelers. GLEAMS was not recommended for the prediction of pesticide fate and transport in the unsaturated zone.

Models exist which can be applied to only saturated or unsaturated porous media or to both. There are models which can only be applied if the soil profile is uniform. Many additional models have been developed for heterogeneous porous media. Some models also consider preferential flow. Some models consider source/sink terms in simple terms while other describe these in considerable detail. Various types of solute transport models will be described in the following sections.

Analytical Models

Analytical solutions of the convective-dispersive equation (17) combined with the linear Freundlich isotherm in one dimension have been derived by numerous researchers (e.g., Cleary and Adrian, 1973; Lindstorm et al., 1967). Gamerdinger et al. (1990) used analytical solutions of a two-site/two-region transport model to study simultaneous pesticide sorption and degradation. The study illuminated the need to know the processes affecting organic-contaminant transport and transformation. Cameron and Klute (1977) developed analytical solutions to the one-dimensional convective-dispersive transport equation with a combined linear Freundlich isotherm and first-order reversible kinetic adsorption. Their one-dimensional chemical transport model with combined kinetic and equilibrium components can be given as:

$$\frac{\beta}{\theta}\frac{\partial S_1}{\partial t}+(1+k_3)\frac{\partial c_s}{\partial t}=D\frac{\partial^2 c_s}{\partial z^2}-v\frac{\partial c_s}{\partial z} \tag{70}$$

where β is the bulk density of the porous medium; θ is the soil water content (volumetric); S_1 is the adsorbed concentration due to kinetics; k_3 is the equilibrium constant; c_s is the concentration of solute in solution; t is the time; D is the hydrodynamic dispersion coefficient; v is the seepage velocity; and z represents depth in the vertical direction. The kinetic component in the above equation was represented by:

$$\frac{\partial S_1}{\partial t}=k_1\frac{\theta}{\beta}c_s-k_2S_1 \tag{71}$$

where k_1 and k_2 are the adsorption and desorption rates, respectively. Their model can be used to simulate transport of pesticides, nutrients, and metals in soils, but does not include a sink term to account for the presence of growing plants.

Stochastic Models

Traditional approaches for modeling the processes of infiltration, redistribution, and solute transport can lead to inaccuracies if the soil spatial variability is relatively large. To better account for this variability, a stochastic modeling approach is sometimes utilized. One such model was developed by Bresler (1991), using the one-dimensional Richard's equation to describe infiltration and redistribution:

$$\frac{\partial\theta}{\partial t}+\frac{\partial}{\partial z}(K\frac{d\psi}{d\theta}\frac{\partial\theta}{\partial z})+\frac{\partial K}{\partial z}=0 \qquad (72)$$

where z is the vertical coordinate directed downward; θ is the soil water content; ψ is the suction head; K is the hydraulic conductivity; and t is the time. A nonhysteretic type of relationship, developed by Brooks and Corey (1964), was used to characterize $K(\psi)$:

$$\frac{K(\psi)}{K_s}=(\frac{\psi_w}{\psi})^{\eta} \qquad (73)$$

$$S=\frac{\theta-\theta_r}{\theta_s-\theta_r}=(\frac{\psi_w}{\psi})^{\beta} \qquad (74)$$

$$\psi \leq \psi_w \leq 0$$

where K_s is the saturated hydraulic conductivity; ψ_w is the air entry potential; S is the degree of saturation; θ_s is the saturated water content; θ_r is the residual water content; and η and β are empirical constants. The value of η varies between

2.0 and 3.5, whereas ß varies between 0.25 and 0.50. It was assumed that all other terms except K_s were constants, and only K_s was spatially and randomly variable. Under these conditions, the spatial variability was expressed with the aid of the joint probability density function (PDF) $f_k(K_{s1}, K_{s2}, K_{s3}, \ldots\ldots, K_{sn})$. Due to the dependence of θ, ψ, and K on K_s, these variables (θ, ψ, and K) are random as well. Since the hydraulic properties are taken as random, flow velocity and therefore solute concentration are also random variables that can be characterized by their PDF. Equation 72 was solved based on the statistical results of the relationships described in equations 73 and 74. The stochastic solution procedure for water and inert solute transport has been explained in detail by Bresler (1991).

Jury et al. (1990) developed a transfer function model of field-scale solute transport under transient water flow conditions. The constructed model is based on the assumption that the solute travel-time probability density function to a depth of interest is an invariant property of the soil when expressed as a function of cumulative drainage. The model produced a good representation of the field data. van der Zee and Bolt (1991) considered both deterministic and stochastic modeling of reactive solute transport subject to adsorption.

Functional Models

Functional models, which can be categorized as deterministic, utilize simplified treatments of solute and water flow instead of a fundamental description of the mechanisms involved in the transport process. As such, the input data needed for these models are considerably less than required for other deterministic and stochastic models. Many of these models exist in the literature (Addiscott, 1977; Bond and Smiles, 1988; Burns, 1975; Tanji et al., 1972).

Pal et al. (1990) used very simple water-balance models for simulation of moisture, salinity, and sodicity profiles in wheat root zones. Corwin et al. (1991) developed a functional model of solute transport called "TETrans". TETrans is a capacity model which defines changes in amounts of solute and water rather than rates of change. The TETrans model is driven by the amounts of rainfall, irrigation, or evapotranspiration (ET) and only considers time indirectly by using the time from one irrigation or precipitation event to another. TETrans models chemical equilibration and plant water uptake. It also considers the problem of bypass which in certain soils can have a profound effect on the movement and distribution of solutes. According to Corwin et al. (1991), the consideration of bypass flow improved the predictive ability of the model.

Numerical Models

Finite Element Models

Neur-el-Din (1986) and Neur-el-Din et al. (1987a, 1987b) developed a salinity management model in which the soil water flow in the presence of a shallow water table was simulated with a form of Darcy's equation and solved by a finite element method. Tracy (1989) developed a finite element model for the simulation of water and solute movement through a root system. According to Tracy (1989), an excellent agreement between measured and simulated soil water content and salt concentration data was obtained. Liu et al. (1991) conducted numerical experiments to investigate scale-dependent macrodispersivity, relative to solute transport in unsaturated porous media. The fluid and solute transport equations were solved by using a three-dimensional finite-element method. A three-step procedure was used in this approach: (a) stochastic generation of a three-dimensional random field with a desired spatial structure for a standardized region of interest; (b) deterministic assignment of initial and boundary conditions for selected three-dimensional fluid flow and solute transport; and (c) deterministic solution of velocity and solute concentration. Simulation of fluid flow and solute transport in this study was done with GS3, a deterministic-conceptual mathematical model (Davies and Segol, 1985). Liu et al. (1991) concluded that the model was suitable only for the simulation of contaminant transport in upper soils where the macrodispersivity results only from lateral variations of percolating velocity.

Yeh and Tripathi (1991) developed a two-dimensional, finite element, hydrogeochemical transport model called "HYDROGEOCHEM". The model can be used to simulate transport of reactive multispecies solutes under heterogeneous, anisotropic, saturated-unsaturated, and steady state or transient flow conditions. The model is capable of simulating complexation, precipitation-dissolution, adsorption-desorption, ion exchange, redox, and acid-base reactions simultaneously. The simulation results obtained by using this model indicated that large errors occur if the number of iterations between the hydrologic transport and chemical equilibrium modules is limited to one. In order to simulate water and solute transport in the presence of plants, a sink term to account for the extraction of water by plant roots would need to be coupled with this model.

Finite Difference Models

Much of the research work with respect to modeling soil water and solute transport in unsaturated soil makes use of finite difference numerical approximations in order to solve the governing partial differential equations. Models which utilize this approach vary in their level of complexity. Therefore the finite difference models will be described under two subheadings, i.e.,"simple" and "complex" models. Models which consider independent movement of individual ions along with their detailed chemistry will be described under the subheading of complex models. All other models which consider solute movement in terms of total salinity and with a less detailed treatment of source-sink terms will be described under the subheading of simple models. The discussion is arranged in order of increasing model complexity.

Simple Models

Bresler and Hanks (1969) devised a numerical method for estimating simultaneous flow of water and salts in unsaturated soils. The method gives reasonable results for non-interacting solutes.

Childs and Hanks (1975) developed a model of soil salinity effects on crop growth. To simulate water extraction by plant roots, they used a sink term, developed by Nimah and Hanks (1973), in the equation for unsaturated flow. This sink term can be given as:

$$A(z,t)=\frac{[H_r+(1.05z)-h(z,t)-s(z,t)]RDF(z)K(\theta)}{\Delta x\Delta z} \qquad \textbf{(75)}$$

where A(z,t) is the sink term; H_r is the effective water potential in the root at the soil surface where z is zero; 1.05 is a combined term to account for resistance to flow in the root (0.05) and for the gravitational head within the root at different depths (1.0); h(z,t) is the soil matric potential; s(z,t) is the osmotic potential; RDF(z) is the fraction of the total active roots in depth compartment Δz; K(θ) is the soil hydraulic conductivity at depth z; and Δx is the distance between the plant roots and the point in the soil surface where h(z,t) and s(z,t) are measured. The osmotic potential was approximated by (Bresler et al., 1982):

$$s = -0.36 EC_e \tag{76}$$

where EC_e is the electrical conductivity of the soil saturation extract (mmhos/cm) and s is the osmotic potential (bars). The one dimensional form of Richard's partial differential equation (10) for unsaturated flow was used for water flow with a sink term (equation 75) included. The equation used for approximation of solute flow was similar to equation 17. The hydrodynamic dispersion coefficient $D(\Theta, v)$, was approximated as:

$$D(\theta, v) = D_0 a e^{b\theta} + \lambda |v| \tag{77}$$

where v is the average flow velocity; D_0 is the diffusion coefficient in pure water; and a, b, and λ are constants. Childs and Hanks (1975) did not include a source-sink term in their solute flow equation and the movement of solute was considered in terms of total salinity. A shallow water table was specified as the lower boundary condition. They observed that the relative effect of initial salinity on upward flow was greater for deep roots than for shallow roots. They also observed that the relative yield of a deep rooted crop was quite high at low irrigation rates due to large amounts of upward flow from the water table. Several other models for the simultaneous movement of water and solute in unsaturated soil also do not consider a source-sink term in the solute transport portion of the model (Bresler and Hanks, 1969; Bresler, 1973; Warrick et al., 1971). The significance of the source-sink term is apparent from the fact that it can account for important chemical reactions such as cation exchange, ionic-pairing, precipitation-dissolution, etc.

A solute transport model "MPNET" developed by Brusseau et al. (1992) explicitly accounts for multiple sources of nonequilibrium and transformation reactions during steady state flow in porous media. Melamed et al. (1977) included a source-sink term in their model for salt flow. Their model considers the movement of bulk dissolved salts instead of moving the individual salts independently. The source-sink term in their model does not consider precipitation-dissolution, ionic-pairing, and ion exchange reactions separately. Instead they assumed that: (a) precipitation and dissolution are the most important source-sink processes; (b) the ion exchange process is not significant; (c) if the soil solution concentration is greater than a specified level, there will be precipitation, and if it is less, dissolution will occur; (d) the source or sink of salts from the specific surface of solid phase compounds is constant; (f) there is a constant rate of the process; and (g) the temperature is constant. Based on the above assumptions, they wrote the sink term as $\alpha K(R-C)$, with

$$\alpha = 1 \quad \text{when} \quad S > 0 \quad \text{or when} \quad R < C$$

$$\alpha = 0 \quad \text{when} \quad S = 0$$

where K is a transfer coefficient related to the soil properties and salt composition; C is the soil solution concentration; R is a specified level of soil solution concentration; and S is mass of solid salt per unit volume. The general salt flow equation for numerical approximation was given as:

$$\frac{\partial(C\theta)}{\partial t}=\frac{\partial}{\partial Z}[D(\theta,q)\frac{\partial C}{\partial Z}]-\frac{\partial(qC)}{\partial Z}+\alpha K(R-C) \tag{78}$$

where C is the salt concentration; θ is the soil water content; D(θ,q) is the coefficient of hydrodynamic dispersion; and q is the flux of water. They suggested, after model testing, that in order to predict leaching accurately, the source-sink term should be varied with depth. The model does not include a mechanism for predicting the value of the source-sink coefficient except through field measurement.

Hillel et al. (1975) developed a microscopic numerical model to simulate soil water uptake and salt movement to plant roots. Their one-dimensional transient water flow equation in a stable and homogeneous soil was similar to equation 10 but with the inclusion of a sink term (water extraction by plants). The flow to a line sink such as an individual root was described as:

$$\frac{\partial\theta}{\partial t}=(\frac{1}{r})\frac{\partial}{\partial r}[rK(\theta)\frac{\partial\phi}{\partial r}] \tag{79}$$

where r is the radial distance from the line sink and ϕ is the soil water potential. To approximate the transfer of water from the soil surrounding each root into the root and thence to the base of the stem, where all roots converge and where the plant emerges from the soil with a single water potential called "crown potential" (ϕ_c), they used the following expression:

$$q_{ex}=\frac{(\phi_m+\phi_0-\phi_c)}{(R_s+R_r)} \tag{80}$$

where q_{ex} is the volume of water extracted per unit time from a unit volume of soil; ϕ_m is the matric potential of some finite ring of soil immediately surrounding any particular root; ϕ_0 is the osmotic potential of the soil solution in the same ring of soil which has a hydraulic resistance R_s; and R_r is the hydraulic resistance of the root. The equation for transient movement of noninteracting solutes was similar to equation 17 with the addition of a source or sink term to account for solute uptake by plants or microbes, volatilization, precipitation or dissolution. There is no mention of how the sink term was quantified in the model. The model was tested to evaluate the effect of the microscopic-scale increase in suction and solute concentration near the root on the rate of change of plant water potential and on the possible development of stress conditions under a constant transpirational demand. The results indicated that the plant water potential required for the continuous extraction of soil moisture rises rather steeply when the localized drawdowns of both matric and osmotic potentials are taken into account.

Hillel et al. (1976) developed a macroscopic-scale model of water uptake by a nonuniform root system and of water and salt movement in the soil profile. The forms of equations used for water and solute approximation were similar to ones used in the microscopic-scale model of Hillel et al. (1975). The rate of flow from a particular soil layer into the root was given by:

$$(q_r)_i = \frac{(\phi_s)_i - \phi_c}{(R_r)_i - (R_s)_i} \tag{81}$$

where $(\phi_s)_i$ is the soil water potential; $(R_r)_i$ and $(R_s)_i$ are the hydraulic resistances of the roots and the soil layer, respectively; and i is the soil layer index. The total extraction rate (Q) from all layers of the soil was described by the summation of the above expression over all soil compartments as:

$$Q = \sum_{i=1}^{n} \frac{(\phi_s)_i - \phi_c}{(R_r)_i - (R_s)_i} \tag{82}$$

where n is the total number of compartments or layers in the soil rooting zone. Their model considers the solute movement in terms of total salinity with no mention of the method of approximation of the sink-source term included in the solute flow equation.

Comparatively little of the research work on the subject of unsaturated flow and solute transport considers heterogeneous soil profiles. Bresler and Dagan (1981) developed a model for convective and pore-scale dispersive solute transport in unsaturated heterogeneous fields. They concluded that the average concentration profile in a heterogeneous field can not generally be modeled as the solution of a convection-diffusion equation with constant coefficients. Selim et al. (1977) developed a numerical model for reactive solute transport through multilayered soil. Both linear and nonlinear equilibrium and first-order kinetic adsorption processes were used to predict adsorption in each layer. The model can be used to simulate transport through saturated as well as unsaturated multi-layered soils.

Gureghian et al. (1979) presented a one-dimensional unsteady-state numerical model for the simultaneous movement of water and solutes through a multi-layered soil under unsaturated flow conditions. Water transport was simulated by using Richard's equation (10). The form of the solute transport equation used in this model can be given as:

$$\theta\frac{\partial c}{\partial t}+\rho\frac{\partial s}{\partial t}=\frac{\partial}{\partial t}(D_0\frac{\partial c}{\partial z})-q\frac{\partial c}{\partial z}\pm Q_j \quad (83)$$

where c is the soil solution concentration; ρ is the bulk density of soil; s is the solute concentration of adsorbed species; Q_j is the rate of removal or supply of solute; and q is the flow velocity. The adsorption of ammonium to the solid phase was approximated by using a nonlinear Freundlich equation:

$$S=R_2c^{\gamma} \quad (84)$$

where S is the concentration of ammonium adsorbed to the solid phase; c is the soil solution concentration of ammonium; R_2 is the adsorption distribution coefficient; and γ is a constant. The transformation of nitrogenous compounds to ammonium was approximated by first-order kinetics. The rate of production (Q) was given by:

$$Q_1=-k_1C_1\theta \quad (85)$$

$$Q_2=k_1C_1\theta-k_2C_2\theta \quad (86)$$

$$Q_3 = k_2 C_2 \theta \tag{87}$$

where k_1 and k_2 are constants; C_1 and C_2 are the concentrations of NH_4^+ and NO_2^-, respectively; and $Q_i (i=1,2,3)$ is the rate of production of NH_4^+, NO_2^-, and NO_3^-, respectively. Two layers were considered with hydraulic conductivities of K_A and K_B. The hydraulic conductivity was considered uniform within each layer. The equations were solved using a two-step implicit finite-difference method. The numerical solution obtained using this model was in acceptable agreement with analytical and experimental results (Gureghian et al., 1979).

Pol et al. (1977) studied the effect of soil properties on the distribution and leaching of chloride and tritium. Their study concluded that soil spatial variability affects the amount and concentration of leachate and also its distribution in the soil profile.

The one-dimensional water and chemical movement model "CMLS", developed by Nofziger and Hornsby (1987), is primarily intended to be used to predict the movement and distribution of pesticides. The model assumes instantaneous displacement and redistribution of water between field capacity and wilting point with no consideration for runoff. Input includes organic carbon in the soil horizons, solute half life, daily potential evapotranspiration values, maximum rooting depth, etc. The output includes graphs as well as tabular summaries of water content, matric potential, concentration and density of chemicals as functions of distance and time, etc.

Water and solute movement through unsaturated soil depends on, among other factors, soil structure and texture. The presence of macropores and an immobile phase can affect the distribution of solute in a soil profile. White (1985) concluded that there will be a non-uniform movement of solute if preferential flow occurs through biologically induced macropores and if a relatively immobile phase is present in smaller pores.

Complex models

Successful simulation of soil moisture, plant water uptake, and movement and distribution of salts depends on the selection of an appropriate model. It is hoped that a model which considers evapotranspiration, water uptake by roots, soil water and solute transport, and important chemical processes may provide good results. Several models exist which simulate moisture and solute flow with or without a source-sink term under unsaturated and/or saturated conditions. Very few models exist which take into account all of the above mentioned processes.

Dutt et al. (1972) developed a combined water and solute transport model in which independent movement of individual ions is considered including important chemical equilibrium processes. In this model, soil water movement is simulated with the one-dimensional Richard's equation with a sink term. The model uses two techniques to simulate water extraction by plants. The first of these assumes that the rate of removal (volume of water per unit volume of soil per unit time) simulating transpiration, evaporation or evapotranspiration is proportional only to depth in the soil and overall extraction rate (useful only if total extraction rate is known to a sufficient degree of accuracy). The second technique is based on consumptive use estimates obtained with the Blaney-Criddle formula. The transport model for individual ions included a sink-source term in which solute changes due to cation exchange of major ions, lime and gypsum solubility, and nitrogen movement, transformation and uptake were included. The cation exchange of only Ca, Mg, and Na was considered in this study. The approaches used in the chemical equilibrium models (sink-source term) of Dutt et al. (1972) and Robbins (1979) were similar to one another. A solute transport model called "CHEMTRN", developed by Miller and Benson (1983), considers important chemical processes (ion exchange and ionic pairing) in saturated, heterogeneous, porous media.

A model for transient changes in soil water and salinity developed by Jury et al. (1978a) considers the movement of individual ions. Water flow calculations used in this model have been described by Jury et al. (1978b). The mass balance for an ion of concentration (C_j) was given by:

$$\frac{\partial(\theta C_j)}{\partial t}+\frac{\partial J_{salt_j}}{\partial z}=0 \qquad \textbf{(88)}$$

where θ is the soil water content and J_{saltj} is ion flux. Based on the assumption that the diffusion and dispersion coefficient was the same for all species, the ion flux equation in this model was written as:

$$J_{salt_j}=(\frac{C_j}{C})J_{salt}=r_jJ_{salt} \tag{89}$$

with

$$J_{salt}=-\theta D\frac{\partial C}{\partial z}+J_{soln}C \tag{90}$$

where J_{salt} is the total solute flux; J_{soln} is the volume flux of solution; D is a combined diffusion and dispersion coefficient for the entire system; and $C = \Sigma C_j$ is the total solute concentration. The chemical equilibrium model developed by Oster and Rhoades (1975) was coupled with the transport model. This chemical equilibrium model considers the ionic-pairing of major ions, precipitation and dissolution of gypsum and calcium carbonates, and cation exchange of sodium, calcium, and magnesium. However the assumptions of this model are specific to a high-frequency irrigation system, with continuous downward flow, and would not apply to a system with appreciable upward movement of water.

Robbins et al. (1980) developed a combined salt transport-chemical equilibrium model for calcareous and grapsiferous soils. Three options for the prediction of salt transport and storage are available in this model. These are (a) individual ion transport without soil interaction, (b) precipitation and dissolution of lime and gypsum during transport, and (c) cation exchange in addition to the precipitation-dissolution reactions. Robbins (1979) constructed a salt transport and storage model for calcareous soils. The model accounts for a sink term (water extraction by roots) in the water flow component and a sink-source term in the salt transport component of the model. In this source-sink term, important chemical reactions which may occur in saline soils have been included. A more detailed description of this model follows.

The potential ET is divided into two components, the potential evaporation (E_p) and the potential transpiration (T_p). The model uses crop cover information to divide ET_p into E_p and T_p. The root extraction term approximates transpiration. This transpiration may be equal to T_p if the matric potential and osmotic potential are high enough. However if these are small, then T will tend to be less than T_p. The root extraction sink term in this model was adopted from Nimah and Hanks (1973) as given in equation (75). This extraction term is dynamic because it is influenced by plant, climatic, and soil conditions. This equation is utilized to approximate the transpiration rate prior to the solving of Richard's equation for unsaturated flow. The root extraction term includes the effect of osmotic potential on water uptake of plants, but does not consider the effects of specific ions. The assumptions are that: (a) the macroscopic approach is valid and sufficiently accurate; (b) the soil profile is uniform; (c) the hysteresis effect is negligible; (d) Δx is equal to 1; (e) the relationship between hydraulic conductivity and matric potential does not change with time (i.e, the soil structure does not change with time); and (f) RDF(z) depends on both depth and time.

The one-dimensional form of Richard's equation for unsaturated flow, in the presence of plants, was adopted from Nimah and Hanks (1973). This equation is used to approximate the distribution of soil water during the simulation period under the assumptions that: (a) the soil profile is homogeneous in depth and time; (b) basic soil properties change only with water content; (c) the root extraction is assumed to be zero when precipitation is taking place; (d) salinity influences yield through the impact on transpiration; (e) plants have a mechanism such that the root water potential can not fall below some minimum value; and (f) water cannot flow out of the plant roots into the soil.

Assuming that the solutes are transported from the combined processes of diffusion-dispersion and mass flow, the expression used for solute transport is similar to the one given in equation (17). The soil water content profile and water flux calculated by the unsaturated flow model are used as input. The model predicts the distribution of individual ions resulting from transport processes. The individual ions considered are Ca^{2+}, Mg^{2+}, K^{+}, Na^{+}, Cl^{-}, SO_4^{2-}, HCO_3^{-}, and CO_3^{2-}.

The assumptions for this transport model are: (a) plant roots do not take up the ions; (b) ions are concentrated in the zone of water uptake; (c) water uptake rates by plant roots are functions of matric and osmotic potential; (d) salts move with upward water flux from a shallow water table if it exists; and (e) salts accumulate in the surface depth increment during periods of evaporation from the soil surface.

To adjust individual ions after predicting their transport and distribution by the transport model, the equilibrium chemistry relationships (precipitation-dissolution, cation exchange capacity, etc.) are utilized. Then electrical conductivity (EC in mmhos/cm or dS/m) is determined from individual ion concentrations by (McNeal et al., 1970):

$$EC=\sum K_o C^b \qquad (91)$$

where C is the ion concentration (meq/l) and K_o and b are coefficients for the individual species. EC as determined above is used to estimate the solution ionic strength (equation 35).

Next the activity coefficients for mono (γ_1) and divalent (γ_2) ions are estimated from the Davies relationship (equation 32) with A equal to 0.509. First approximations of ion activity are made from activity coefficients. For example, potassium activity (K) is approximated as:

$$(K)=[K]\gamma_1 \tag{92}$$

where [K] is the concentration of potassium in solution. The activities are then corrected for ion pairing and ionic strength in a chemical equilibrium loop. The activities of Ca, Mg, Na, and SO_4^{2-} are corrected using equations 52, 53, 54, and 55, respectively. The activities of CO_3^{2-} and H (hydrogen ion activity) are corrected by making use of equations 25 and 29, respectively. K_{d1} through K_{d10} are stability constants for $CaCO_3^0$, $CaHCO_3^+$, $CaOH^+$, $CaSO_4^0$, $MgCO_3^0$, $MgHCO_3^+$, $MgOH^+$, $MgSO_4^+$, $NaSO_4^-$ and $NaCO_3^-$, respectively, in these equations.

After correction of Ca, Mg, Na, and SO_4 activities for ionic strength and ionic pairing, a precipitation subroutine is used to bring the soil solution in equilibrium with lime and gypsum. In this subroutine, the soil solution is checked with respect to saturation of gypsum and lime and any changes in activities of cations and anions, due to dissolution or precipitation, are estimated.

Then a cation exchange subroutine is used to determine exchangeable cation concentrations from the CEC and cation activities (equations 66-69). Exchangeable sodium percentage and sodium adsorption are estimated as the last step in the chemical equilibrium model. It is assumed that: (a) the buffering capacity of soil is sufficient so that the pH is constant within each depth increment; (b) the soil profile has lime in sufficient quantities; (c) carbon dioxide (CO_2) can freely enter or leave the soil system; (d) Henry's law constant is independent of temperature and salt concentration; (e) the sum of exchangeable cations is equal to the CEC; and (f) exchange reactions are sufficiently rapid such that reaction rates are ignorable.

The chemical equilibrium model of Dudley et al. (1981) is quite similar to the one used by Robbins (1979).

Hutson and Wagenet(1987) developed a process-based model called "LEACHM". Different forms of this model can be applied for predicting the movement and distribution of water, nonvolatile and volatile pesticides, and inorganic chemicals in the root zone environment. Various versions of LEACHM include submodels for: (a) water flow, (b) pesticide transport, (c) pesticide degradation, (d) nitrogen transport and degradation, and (e) transport of inorganic ions and their equilibrium chemistry. The form of LEACHM which was developed for nonvolatile pesticides is called "LEACHP", and that describing the movement of inorganic chemicals is called "LEACHC". LEACHC has the capability to consider layered soils, multiple precipitation or evapotranspiration cycles, movement of individual ions and their important reactions, and several upper and lower boundary conditions.

For the water flow submodel, Richard's equation in the one-dimensional form (equation 10), with a sink term for water uptake by plants, is solved. In order to run the water flow model, expressions relating water content, matric potential and hydraulic conductivity are needed. The relationship between matric potential and water content is described by a two-part function developed by Hutson and Cass (1987), or by the expression developed by Campbell (1974). The function developed by Hutson and Cass is:

$$h=\frac{a[1-(\frac{\theta}{\theta_s})^{\frac{1}{2}}](\frac{\theta_i}{\theta_s})^{-b}}{[1-(\frac{\theta_i}{\theta_s})]^{\frac{1}{2}}} \tag{93}$$

$$0 > h > h_i$$

$$h=a(\frac{\theta}{\theta_s})^{-b} \tag{94}$$

$$h_i > h > -\infty$$

with

$$h_i=a[\frac{2b}{(1+2b)}]^{-b} \tag{95}$$

and

$$\theta_i=\frac{2b\theta_s}{(1+2b)} \tag{96}$$

where h_i, θ_i is the point of intersection of the two curves; h is the matric potential; θ_s is the saturated water content; and a and b are constants.

The relationship for hydraulic conductivity as a function of h is:

$$K(h) = K_s\left(\frac{a}{h}\right)^{2+\frac{(2+p)}{b}} \tag{97}$$

where K_s is the saturated hydraulic conductivity and p is a pore interaction parameter. This equation is used for $h < h_i$. When $h > h_i$, K is expressed as a function of Θ:

$$K(\theta) = K_s\left(\frac{\theta}{\theta_s}\right)^{2b+2+p} \tag{98}$$

Alessi et al. (1992), in a study to evaluate five hydraulic property models, concluded that the modified version of the Hutson and Cass (1987) two-part function fits retention data better than the expressions developed by Brooks and Corey (1964), Clapp and Hornberger (1978), Hutson and Cass (1987), and van Genuchten (1980).

Water extraction by roots is approximated with the expression developed by Nimah and Hanks (1973), as given in equation (75). The governing equation for solute movement is similar to the one given in equation 17.

The LEACHP form of LEACHM and the PRZM model were utilized to study the movement of atrazine (Smith et al., 1991). It was found that LEACHP predicted more accurately the hydrological characteristics of the soil columns but both models underpredicted levels of atrazine near the soil surface and in the leachate. Wagenet et al. (1989) also utilized the LEACHP version of LEACHM to study the movement of DBCP (1, 2-dibroma-3-chloropropane). The simulated and measured DBCP solution concentrations were different. The error was attributed to the extraction apparatus, hypothesizing that substantial quantities of DBCP were lost in the gaseous form during the extraction process.

Because the LEACHC version of LEACHM has the option of assigning the lower boundary condition to be a saline shallow water table, it seems appropriate to use this version for studying the relationship between water table depth and upward movement and accumulation of salts. LEACHC handles in detail the chemistry of individual ions.

CHAPTER III

MODEL DESCRIPTION AND VALIDATION

Description of LEACHC

Overview of LEACHC

LEACHM (Leaching Estimation And CHemistry Model) is one of the more complex and comprehensive models for simulating processes in crop root zones (Hutson and Wagenet, 1992). It has five different versions: LEACHB, LEACHC, LEACHN, LEACHP, and LEACHW. LEACHB describes microbial population dynamics in the presence of a single growth-supporting substrate. LEACHC describes the transient movement of water and inorganic ions and their equilibrium chemistry. LEACHN models nitrogen transport and transformations. LEACHP can be used to simulate pesticide displacement and degradation. The LEACHW version of LEACHM is available to simulate the movement and distribution of water only.

The LEACHC version of LEACHM was selected for use in this study. LEACHC allows the flexibility of choosing various boundary conditions depending on the particular situation. In terms of its approach to soil chemistry, LEACHC can be categorized as a complex model. It considers the independent movement of individual ions. Also the soil solution phase is equilibrated with the solid phase using precipitation-dissolution of lime and gypsum, significant ionic-pairing, and cation exchange. A brief description of LEACHC is presented here, and a flow chart is provided in Figure 1.

Unsaturated Flow

To model the movement of soil water, LEACHC uses a finite-difference solution of the one-dimensional Richard's equation for unsaturated flow (equation 10 but with a sink term). Solution of this equation requires knowledge of the relationships among soil water content (θ), matric potential (h), and hydraulic conductivity (K), in addition to sources and sinks (irrigation, rain, evaporation, transpiration, upward capillary flux, etc.) and appropriate boundary conditions. To approximate K-h-θ relationships, different options are available in the model. The model uses either the expressions developed by Campbell (1974) or fits two-part retentivity functions developed by Hutson and Cass (1987) as given in equations 93 to 98. If the retentivity function developed by Hutson and Cass is selected, various regression equations are available (Cosby et al., 1984; Hutson, 1986; Hutson and Wagenet, 1992; and Rawls and Brakensiek, 1985).

The model uses the method of Childs and Hanks (1975) to approximate evapotranspiration. From weekly pan evaporation totals (P), the model calculates daily potential evapotranspiration (ET_d). To determine daily potential transpiration (T_d), ET_d is multiplied by the crop cover fraction (C_{cf}). The equation for approximation of crop cover

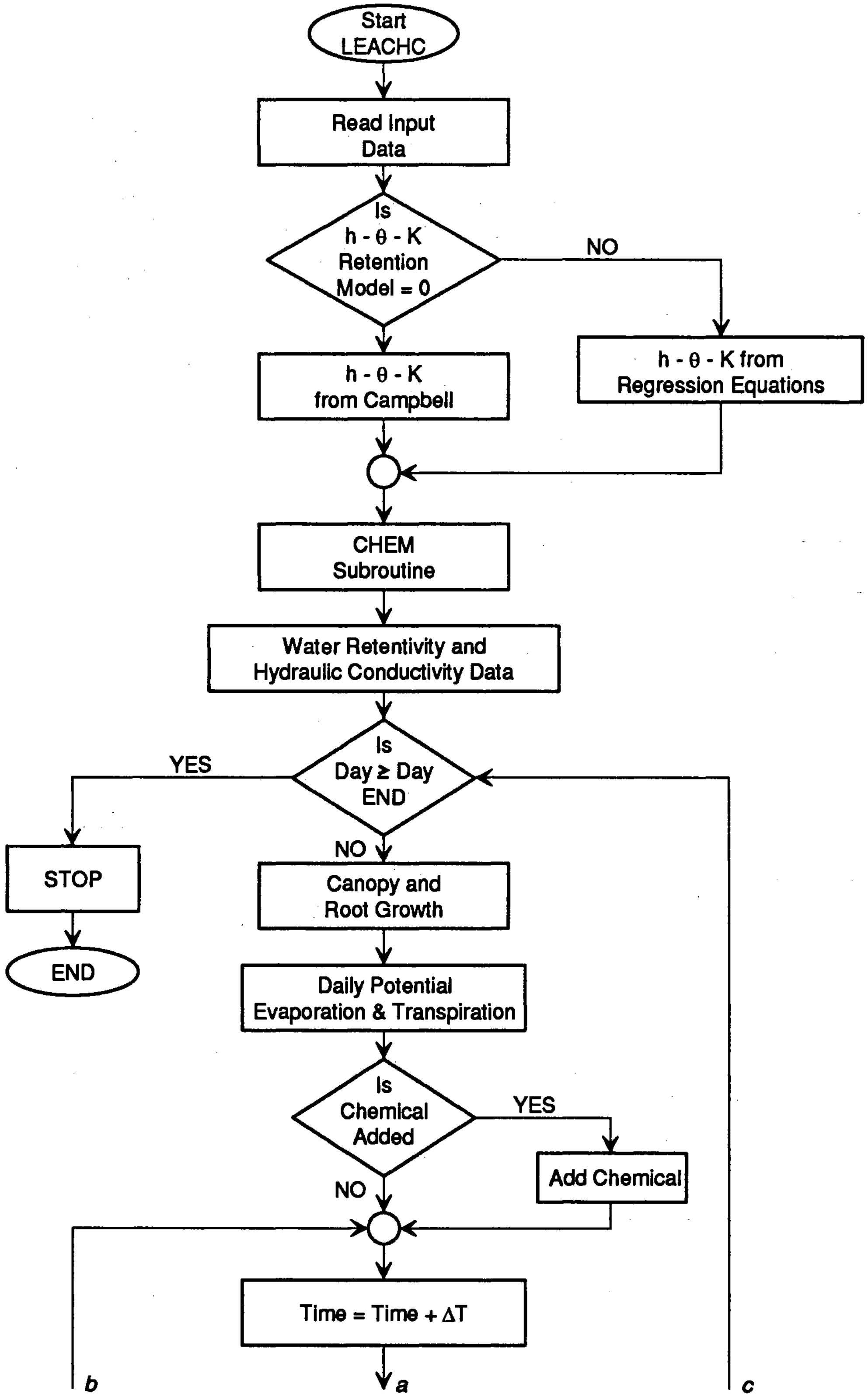
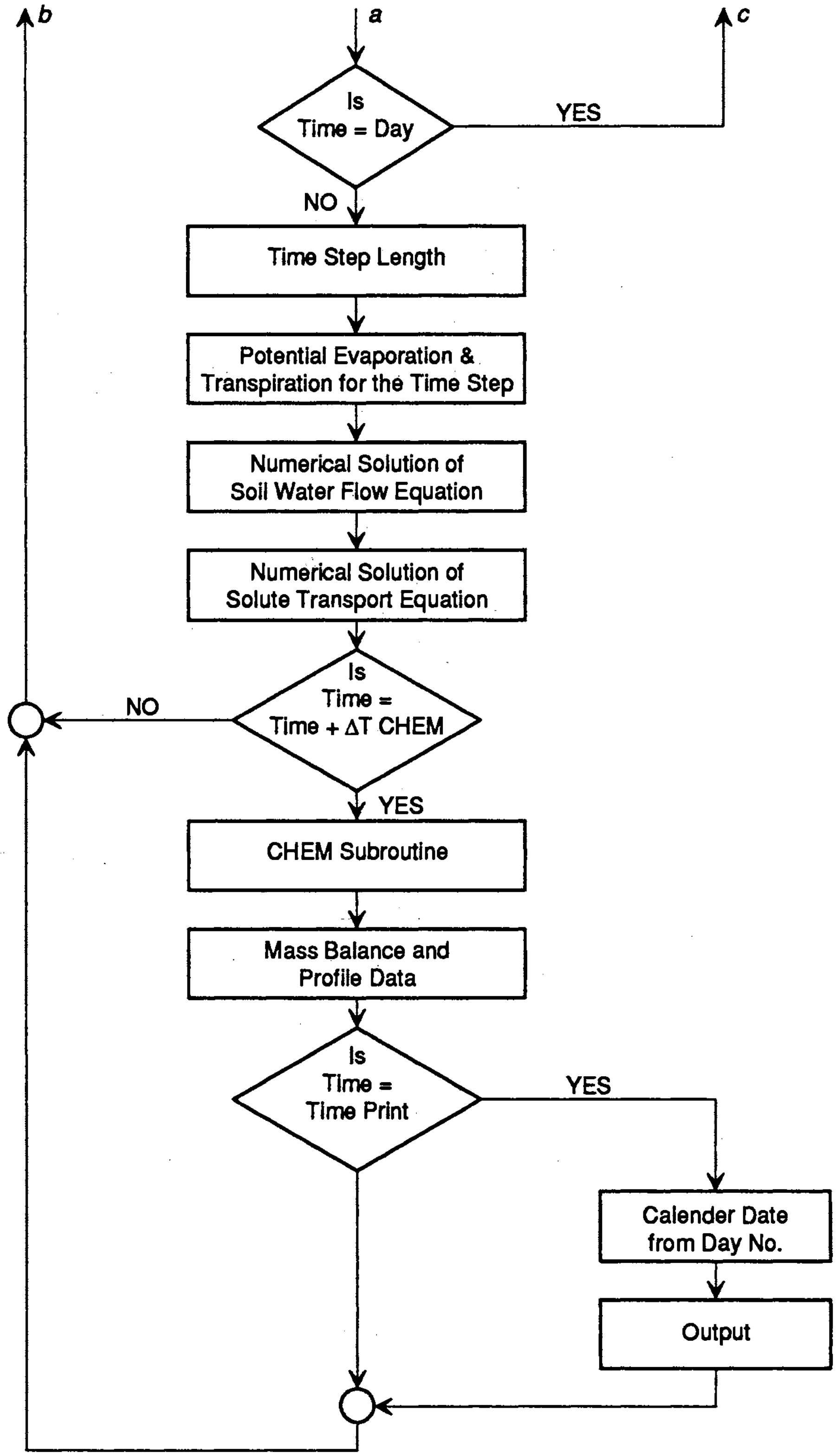


Figure 1. Flow Chart for LEACHC (After Hutson and Wagenet, 1992)



(Figure 1. Continued)

is the one developed by Childs (1975). The model then determines daily potential surface evaporation (E_d) as the difference between ET_d and T_d. The model assumes that evapotranspiration starts at 0.3 day and ends at 0.8 day. During this period, potential evapotranspiration flux density (ET_p, mm/day) varies sinusoidally.

The equations used for root growth and root density distribution as a function of time are based on those given by Davidson et al. (1978). The only addition in the model is an adjustable total root depth to accommodate the simulation of various soil profile depths. LEACHC approximates the water uptake rate by roots using equation (75), developed by Nimah and Hanks (1973). An iterative bisection procedure is used in the model to search for a value of H_r (effective water potential in the root at the soil surface) such that the amount of water extracted over the root profile equals the potential transpiration. It is assumed that it is not possible for water to flow from the plant root into the soil. The value of H_r must be between 0 and a specified lower limit (usually about -3000 kPa). There will be no transpiration below a soil water content corresponding to -1500 kPa. The above ensures that in drier soils, actual transpiration will be less than the potential transpiration. The sink term also includes the effect of osmotic potential.

A number of possible upper and lower boundary conditions are provided in the model. The upper boundary condition may be ponded or non-ponded infiltration, evaporation or zero flux.

The pressure potential of the first node is set equal to zero during ponded infiltration, whereas a flux controlled boundary condition exists during the periods of evaporation, non-ponded infiltration and zero flux. Five different lower or bottom boundary conditions are provided in the model. These are: (a) a fixed water table depth; (b) a free draining profile; (c) zero flux; (d) a lysimeter tank; and (e) a fluctuating water table.

Use of Richard's equation for unsaturated flow assumes that the soil is homogeneous horizontally, and that there is no preferential flow. However an option in the model considers preferential flow based on the capacity model of Addiscott (1977).

Solute Transport

After the solution of Richard's equation for unsaturated flow including sinks, the movement and distribution of solutes are modeled by solving numerically the convection-diffusion equation (CDE). In LEACHC, sink and sorption terms are not included in the CDE. Instead, each solute species is transported by diffusion and convection during each time step (equation 17). The effective diffusion coefficient, $D(\theta)$, is approximated by using the relationship developed by Kemper and van Schaik (1966). The model can handle the movement and distribution of Ca, Mg, Na, K, Cl, SO_4, CO_3, HCO_3, H, OH, and their major ion pairs. The time step for the water flow and solute transport equations can be selected by the user, but must be between 0.05 and 0.1 day.

After the determination of ion movement and distribution, these are equilibrated with exchange and precipitated phases including ionic pairing, at certain specified time intervals. To do that, the model uses a chemical equilibrium subroutine.

Chemical Equilibrium

After the solution of the CDE, chemical species are equilibrated by using the "CHEM" subroutine (flow chart given in Figure 2), which itself consists of several subroutines and function subprograms. After necessary unit conversions, the sum of exchangeable cations is checked against the soil's cation exchange capacity (CEC) and if the values differ, the program terminates with the message that the CEC exceeds total exchangeable cations. If the initial cations are both exchangeable and in solution, then they are partitioned according to the ratio of the CEC to total cations. Next the overall charge balance is calculated and if there is any difference, it is represented as a "balancing ion". Then the concentrations of Ca and SO_4 and/or CO_3 are checked and if they are high enough, the lime and gypsum concentrations are increased and solution concentrations of Ca, SO_4, and CO_3 are decreased. The first approximations of free ion concentrations are based on total concentrations without taking into consideration the ionic pairing. The first estimate of ionic strength is made from the concentrations of cations and

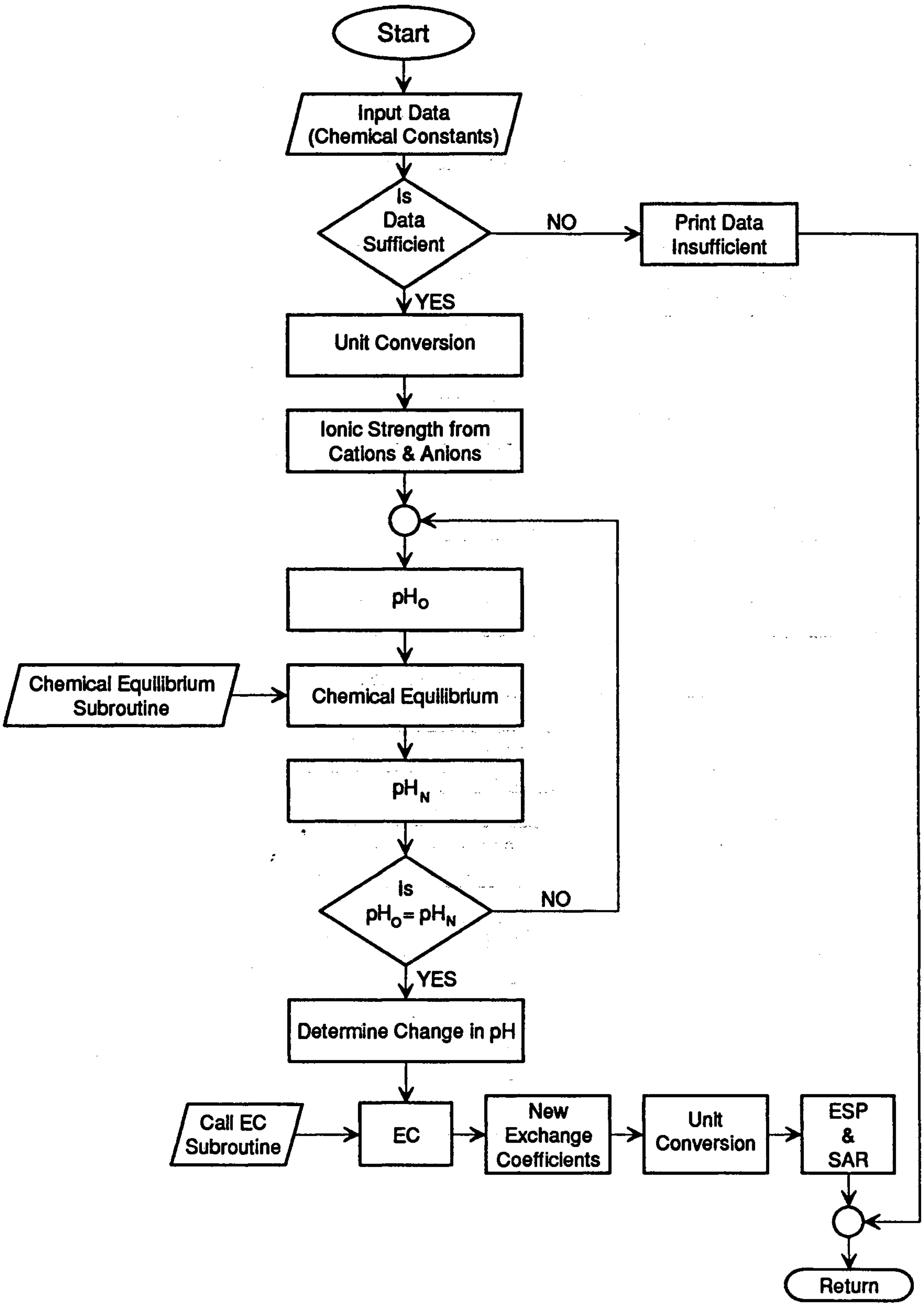


Figure 2. Flow Chart for CHEM Subroutine

anions. Next an iterative procedure is used to find pH to an acceptable accuracy. Within the pH iteration loop, the chemical equilibrium subroutine is called.

In the chemical equilibrium subroutine (flow chart given in Figure 3), activity coefficients are approximated by using either calculated ionic strength or the relationship given in equation 35. Various thermodynamic constants (K_{a1}, K_{a2}, K_w, K_d's, K_i,s, etc.) are changed to conditional constants. Next the concentrations of H, OH, HCO_3, and CO_3 are determined from pH and various conditional constants. The soil solution is then equilibrated with lime and gypsum using a precipitation subroutine. If the solution is undersaturated or oversaturated, then a sink subroutine is used to determine how much lime and gypsum needs to be dissolved or precipitated. Next the total concentrations of SO_4, HCO_3, CO_3, OH, $CaSO_4$, $CaCO_3$, and the activities of Ca, Mg, Na, and K are determined taking into consideration the ionic pairing. Then an exchange subroutine is utilized to bring the solution into chemical equilibrium with the exchange phase. After this equilibrium is achieved, once again adjustments in lime and gypsum and calculations of total concentrations of Ca, CO_3, HCO_3, and OH are performed (taking into consideration the ionic-pairing). Again ionic strength is calculated from ionic concentrations and the subroutine is exited if the difference in pH values calculated before and after the chemical equilibrium loop is within an acceptable range. Otherwise program control again goes to the start of this subroutine. The equations used in

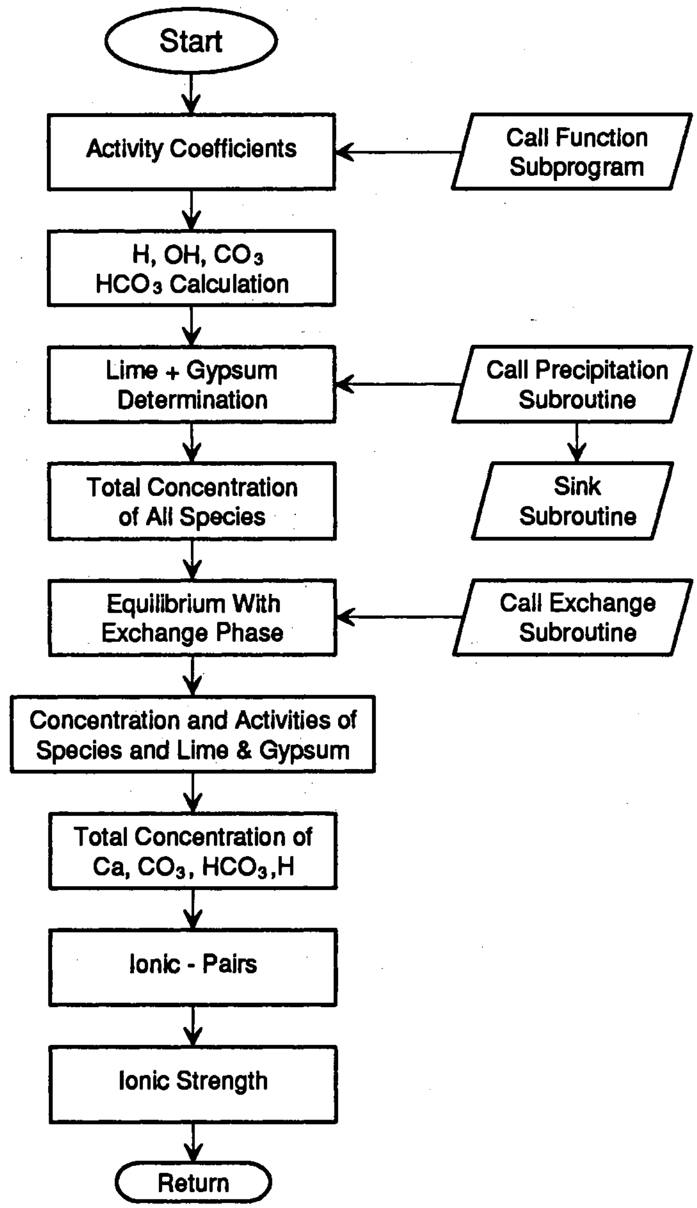


Figure 3. Flow Chart for Chemical Equilibrium Subroutine

the chemical equilibrium subroutine are from Robbins (1979) with slight modifications.

After exiting the chemical equilibrium subroutine, the rest of the CHEM subroutine determines any charge imbalance in solution and sets new bounds for pH. Next electrical conductivity is determined from either the expression developed by McNeal et al. (1970), or Marion and Babcock (1976). The equation developed by McNeal et al. (1970) is an empirical equation and determines electrical conductivity from the concentrations of Ca, Mg, Na, Cl, SO_4, HCO_3, and CO_3. Next, new exchange coefficients and the amounts of lime and gypsum (after precipitation and dissolution) are determined. ESP and SAR are calculated as the last step in this subroutine.

After exiting the CHEM subroutine, the time step is incremented. If it is a new day, control passes to the growth subroutine; otherwise the model executes the routines related to transpiration, unsaturated flow, etc. Due to the relatively small fluxes of chemical species, it is not usually necessary to call the chemical equilibrium subroutine at each time step. It can be called after every 4 to 10 time steps without sacrificing accuracy.

Input Data Requirements

Most of the input data required for LEACHC is format free and can be provided in tables which are created by editing an already existing input file. The starting and ending dates for the simulation must be specified. LEACHC requires the total profile depth and segment thickness in mm. Since the profile depth is divided into equal segments, this depth should be a multiple of the segment thickness.

In the case of a layered profile, soil textural properties (% clay, % silt, % organic carbon), starting θ or matric potential, and soil retentivity parameters can be provided for each segment. For a uniform soil profile, LEACHC accepts single representative values for retentivity parameters for the entire profile. One of six particular retention models can be specified for the approximation of K-h-θ relations.

LEACHC accepts values of weekly potential evapotranspiration (ET) in mm for the entire simulation period. The number of entries in the potential ET table should be greater than the number of weeks to be simulated. For rain and/or irrigation, the starting time, amount, and rate of application must be provided. Even if there is no irrigation, at least one irrigation event needs to be specified, the date of which can be past the simulation end date. If the specified application rate of irrigation or rain exceeds the infiltration capacity of the soil, then the soil surface is assumed to be saturated and the remaining water infiltrates under a surface boundary condition of zero pressure potential. Ponded infiltration can be set for any application event by specifying 999.9 for the rate of application. If a constant water table is selected as the lower boundary condition, then the depth to water table in mm is needed. If a fluctuating water table is specified, then weekly values of water table depth are required.

Dry application (not dissolved in irrigation water) of chemical can also be provided as input to LEACHC. Even if no such application is desired, at least one past the end date must be specified in order to read the data. A representative diffusion coefficient for all chemicals in the gas phase is also required as input.

LEACHC provides three options with respect to simulation of crops: (a) no plants present; (b) constant root distribution and crop cover; and (c) a growing crop. For option (b), the model requires the crop cover and the fraction of active roots (RDF_i) in each depth segment. To simulate crop growth, it is necessary to provide the dates of planting, emergence, root maturity, and plant maturity together with the crop cover fraction at maturity.

The chemical data required as input for each segment of the soil profile are: (a) initial composition (either as soluble, or exchangeable plus soluble ions); (b) exchangeable cations and cation exchange capacity; and (c) selectivity coefficients along with partial pressure of CO_2, and calcite and gypsum fraction.

LEACHC requires the chemical composition of irrigation water (if applied) and the chemical composition of underground water if a water table boundary condition is selected. Henry's law constant (K_H) for CO_2, dissociation constant (K_w) of water, first and second dissociation constants of H_2CO_3, ion pair stability constants (K_d's), and solubility products (K_{sp}'s) for gypsum and lime are not required as input, but these can be changed within LEACHC if desired. In the chemical equilibrium subroutine, there are provisions for handling different types of input data. For example, if solution and exchangeable cations are available as input data, then the model can determine the exchange coefficients. On the other hand, if exchange coefficients and initial soluble ions are available as input data, then it can determine the exchangeable cations.

Model Validation

Researchers have applied and tested various versions of LEACHM. For example, the performance of LEACHP has been evaluated by comparing results to field data (Jemison and Fox, 1992; Pennell et al., 1990; Petach et al., 1991; Smith et al., 1991; Wagenet et al., 1989). The LEACHC version of LEACHM has apparently not been tested under the lower boundary condition of a saline shallow water table. Prathapar et al. (1992) applied LEACHC for estimating capillary rise from a saline shallow water table. However, they did not consider chemical equilibrium processes (precipitation, cation exchange, etc.) in simulations, and the estimate of total salt increase within the profile was obtained by multiplying the salt concentration in the water table by the cumulative capillary rise.

One objective of this study was to test and evaluate the performance of LEACHC under saline shallow water table conditions. To accomplish this task, two different sets of data were identified.

Lysimeter Data

Source of Data

Ram et al. (1981) reported on a lysimeter experiment conducted at Hissar (Haryana), India. The lysimeters were placed in a greenhouse and had a diameter of 560 mm and a height of 2000 mm. Two different crops, maize and wheat, were grown in the lysimeters with either a saline or nonsaline water table maintained at one of three depths (500, 1000, and 1500 mm). For each crop at each water table depth and each water composition, two surface treatments were used (no mulch, mulch). For the mulched treatments, a rice husk mulch of 50 mm was applied to the soil surface after seedling emergence in order to suppress surface evaporation.

Input Data

The soil used to fill the lysimeters was described as sandy loam (coarse loamy calcareous Typic Camorthids). Since a detailed textural analysis and some of the chemical properties of this soil were not available in the reference, additional soil information was obtained from Manchanda and Khanna (1981a & 1981b). It was assumed that the soil properties with depth in the lysimeter were uniform. The soil textural properties (% sand, silt, clay) were "fine-tuned" slightly so that the predicted evapotranspiration values agreed fairly well with those measured in the experiment (especially for treatments with a 1500 mm water table depth). The soil textural and chemical properties used as input in LEACHC are presented in Table 2.

TABLE 2

SOIL TEXTURAL AND CHEMICAL PROPERTIES (LYSIMETER DATA)

Soil Type	Sand (%)	Silt (%)	Clay (%)	OC (%)	CEC*	$CaCO_3$ (%)
Sandy loam	50.00	30.00	20.00	0.28	7.30	2.40

* meq/100 g soil

Once the soil physical composition is known, its hydraulic properties can be inferred using empirical relationships. Fayez-El-Komos et al. (1979) determined soil water functional relationships for some soils in Haryana state, India. For the type of soil used in this study, the saturated hydraulic conductivity varied between 230 and 350 mm/day. A value of 290 mm/day was selected to represent saturated hydraulic conductivity. The saturated water content (assumed to be gravimetric) was reported by Ram et al. (1981) to be 33%, and the bulk density was given as 1.40 g/cm^3. Thus the volumetric water content at saturation would be about 0.46, which is consistent with values reported by others for this type of soil (Fayez-El-Komos et al. 1979; Malik et al., 1982; Oswal and Khanna, 1981; and Singh et al., 1982). A two-part retention function (Hutson and Cass, 1987) and regression equations provided in LEACHC were used to estimate K-h-θ relationships.

The initial concentrations of cations and anions in the soil were converted from meq/100g soil, as given in the original source, to mmol/l as required by LEACHC (Table 3). These values are for a saturated soil and need to be adjusted if the field water content at the start of the simulation is below saturation. The soil's exchangeable cation composition (Table 4) was estimated from Oswal and Khanna (1981).

TABLE 3

INITIAL CHEMICAL COMPOSITION OF SATURATED SOIL (mmol/l)
(LYSIMETER DATA)

Ca	Mg	Na	K	Cl	SO_4
10.45	4.48	23.28	7.16	29.86	4.63

The selectivity coefficients were also not available from the original source. These coefficients vary from soil to soil; values reported by various researchers are listed in Table 5. The Hansi cultivated soil is from the same area, but its textural properties are slightly different from the soil in this study. Values of K2, K5, and K6 were obtained from

Metha et al. (1982) and K1 and K3 were calculated from these selectivity coefficients. Only K1, K2, and K3 are required as input to LEACHC and are given in Table 6.

TABLE 4

SOIL'S EXCHANGEABLE CATION COMPOSITION (mmol/kg soil) (LYSIMETER DATA)

Ca	Mg	Na	K	CEC
46.0	16.0	5.0	6.0	73.0

Only one irrigation was applied to the lysimeters used in this experiment, and that was prior to sowing. The crops used ground water to meet their water requirements. Monthly data on ground water use by maize and wheat were available (Appendix A). Since the experiments were conducted in a greenhouse, and since more detailed information was not available, it was assumed that water use was uniform during a month. In the case of mulched wheat treatments, where there was no reported consumption of water during the first week, a small amount was used as input to avoid mathematical overflow errors. Good quality (electrical conductivity, EC, of 0.4 dS/m) and poor quality water (EC of 4.0 dS/m) were used in the experiments to represent the presence of a nonsaline and saline water table, respectively. The treatments with the good quality water were not included in this study because the available water table

TABLE 5

SELECTIVITY COEFFICIENTS FOR VARIOUS SOILS (LYSIMETER DATA)

Source	Soil type	K1 (Mg/Ca)	K2 (Ca/Na)	K3 (Ca/K)	K4 (Mg/K)	K5 (Mg/Na)	K6 (K/Na)
Robbins (1979)	Penoyer loam	0.84	6.60	0.38			
	Hunting silty clay loam	0.83	5.80	0.38			
Sharma et al. (1988)	Bikron		2.23				
	Sarol		1.95				
Metha et al. (1982)	Bikron		2.40				
	Powarkheda		1.93				
	Kamliakheri		2.06				
	Hansi cultivated		2.38				7.14
Metha et al. (1985)	Hansi cultivated		1.03			1.34	
Paul et al. (1966)	Oklay	0.64	5.50				
	Hanford	0.54	7.00				
	Arbuckle	0.59	5.60				
	Yolo	0.67	7.10				
	Sacromanto	0.66	6.80				

TABLE 6

GAPON'S SELECTIVITY COEFFICIENTS (LYSIMETER DATA)

K1 (Mg/Ca)	K2 (Ca/Na)	K3 (Ca/K)
0.87	2.38	0.33

composition data were not sufficient to meet the input requirements of LEACHC. The ground water composition used to represent the 4.0 dS/m water is given Table 7.

TABLE 7

WATER TABLE CHEMICAL COMPOSITION (LYSIMETER DATA)

EC (ds/m)	Ca	Mg	Na	Cl	SO_4
	-----	-----	mmol/l	-----	-----
4.0	4.0	2.5	12.0	18.0	3.5

There were 6 maize plants and 14 wheat plants per lysimeter. The maize crop was sown at the end of July and harvested during the last week of October. The wheat crop was sown during the third week of November and harvested by the end of April. Dates of emergence, root maturity, and plant maturity for these crops were estimated from published literature for that location (Anonymous, 1930; Rao, 1975).

The fraction of the ground surface covered by plants at plant maturity is used as an input in LEACHC to represent crop cover. It is used to partition daily ET between transpiration and evaporation. The crop cover fraction is multiplied by ET to get transpiration and the rest of ET is assigned to evaporation unless limited by the soil physical and hydraulic properties. A value of 0.90 was used as the crop cover fraction for all unmulched treatments, and a value of 1.00 was used for all mulched treatments. Although there were differences in yields (Table 8) and salt accumulations among the treatments, it would be very difficult to use that information to infer crop cover differences. A limited sensitivity analysis indicated that, using these values of 0.90 and 1.0, the total ET predicted by the model agreed well with that measured in the experiment. Since the density of plants in the lysimeters was about 3 to 4 times the normal density under field conditions, the assumption of a crop cover of 0.90 for each unmulched treatment seemed reasonable.

The data described above were assembled for input into LEACHC. For further details on the experiment and the data, the reader is referred to Ram et al. (1981). A total of 12 treatments was examined (6 for wheat and 6 for maize). The symbols used to designate these 12 treatments are: the first letter indicates the mulch condition (N for no mulch; M for mulch); the second letter indicates the crop (W for wheat and M for maize); and the last three numbers indicate the depth of the water table (050 for 500 mm; 100 for 1000 mm; and 150 mm for 1500 mm depth). For example, NW050 denotes the treatment in which there was no mulch, the crop grown was wheat, and the water table depth was 500 mm.

TABLE 8

MAIZE AND WHEAT GRAIN YIELD IN VARIOUS LYSIMETER TREATMENTS

Crop	Yield (Kg/Hectare) at Water Table Depth (mm)		
	500	1000	1500
Maize			
Unmulched	12708	13276	13845
Mulched	16443	14738	14007
Wheat			
Unmulched	1281	4791	6577
Mulched	4141	6171	7308

Results and Discussion

In the study by Ram et al. (1981), the chemical composition of the soil profile was measured only once (after harvesting of both the crops) and ionic concentrations were available for only two depths along the soil profile. The measured electrical conductivity (EC) and HCO_3/H_2CO_3 concentrations were not compared with those predicted by LEACHC. It was not clear whether the measured values were H_2CO_3

or HCO_3, (for wheat treatments it was given as HCO_3 and for maize treatments it was given as H_2CO_3). Similarly the initial measured EC value was suspicious. The initial chemical composition of the soil profile was not consistent with the reported EC. It is possible that the method used for EC determination was incorrect.

The observed and predicted concentrations of six ions were compared for each of two depths: the surface layer (0 to 150 mm depth) and a "deep" layer (300 to 450 mm for the 500 water table depth, 750 to 900 mm for the 1000 mm water table depth, and 1200 to 1350 mm for the 1500 mm water table depth). Since these depth intervals represent more than one soil layer in LEACHC, the predicted concentrations represent an average. The chemical concentrations estimated by LEACHC are at field water content. Therefore the predicted concentrations were adjusted to saturated water content in order to compare with the measured concentrations. Measured and predicted concentrations of Ca, Mg, Na, K, Cl, and SO_4 for all treatments are given in Appendix B. Figures 4 to 15 present these data in graphical form.

In general, there was relatively poor agreement between predicted and observed concentrations for the 500 mm water table depth, for both unmulched and mulched wheat treatments (Figures 4 to 9). The agreement improved for the 1000 and 1500 mm depths. In the case of both mulched and unmulched maize treatments at 500 mm depth, the agreement was better than wheat (Figures 10 to 15). The agreement between predicted

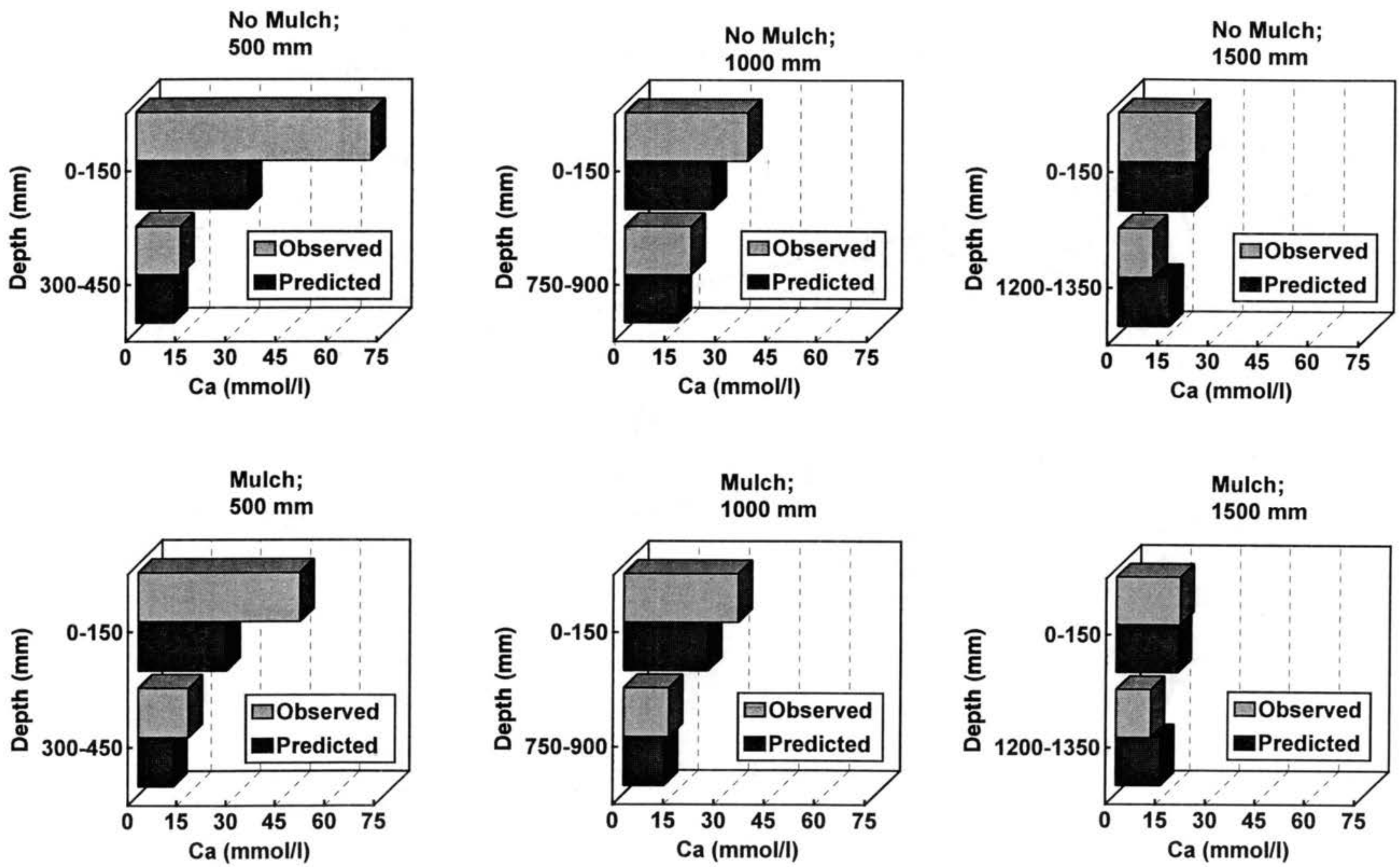


Figure 4. Comparison between Observed and Predicted Ca (mmol/l) for Wheat Treatments (2 Mulch Conditions; 3 Water Table Depths)

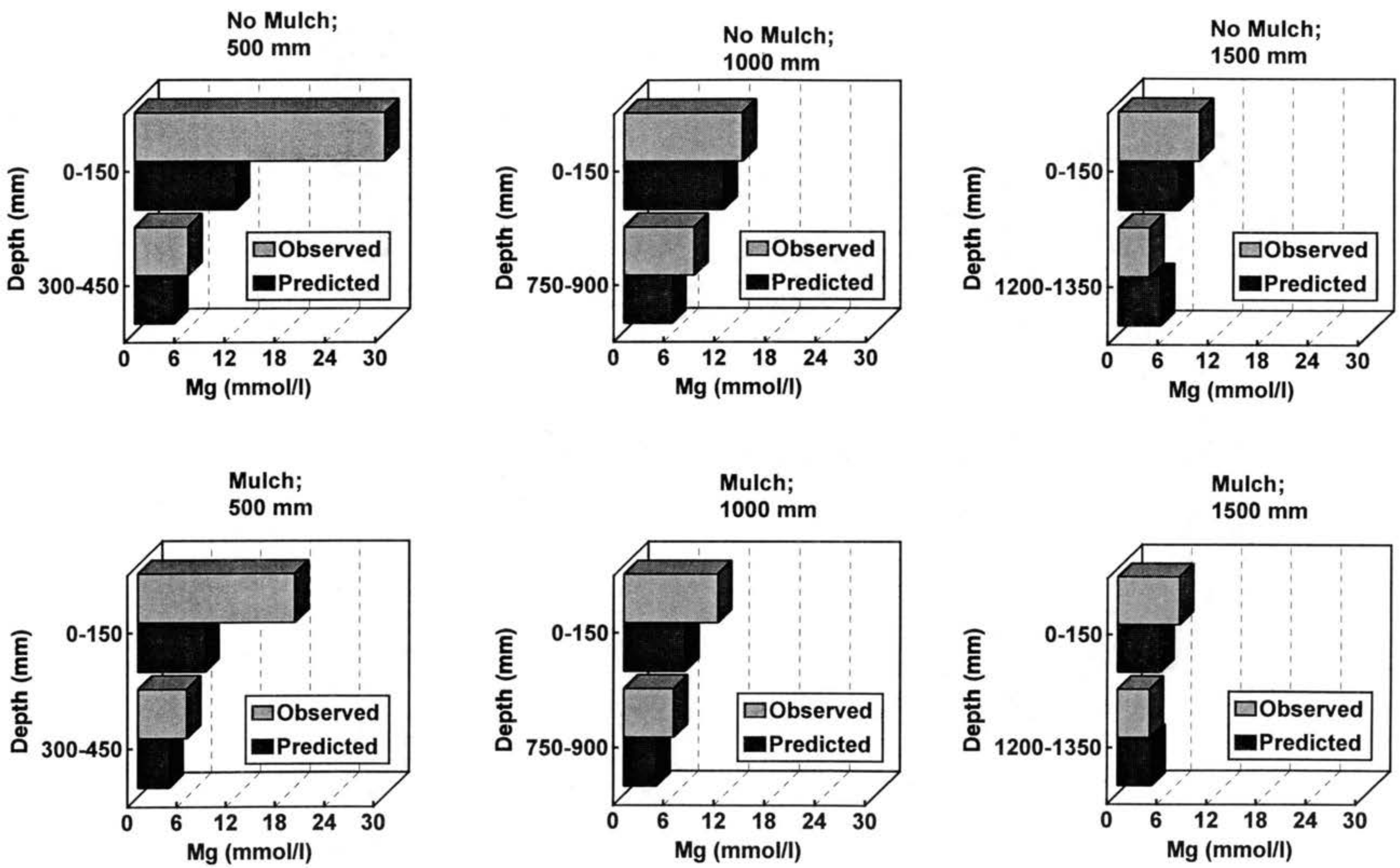


Figure 5. Comparison between Observed and Predicted Mg (mmol/l) for Wheat Treatments (2 Mulch Conditions; 3 Water Table Depths)

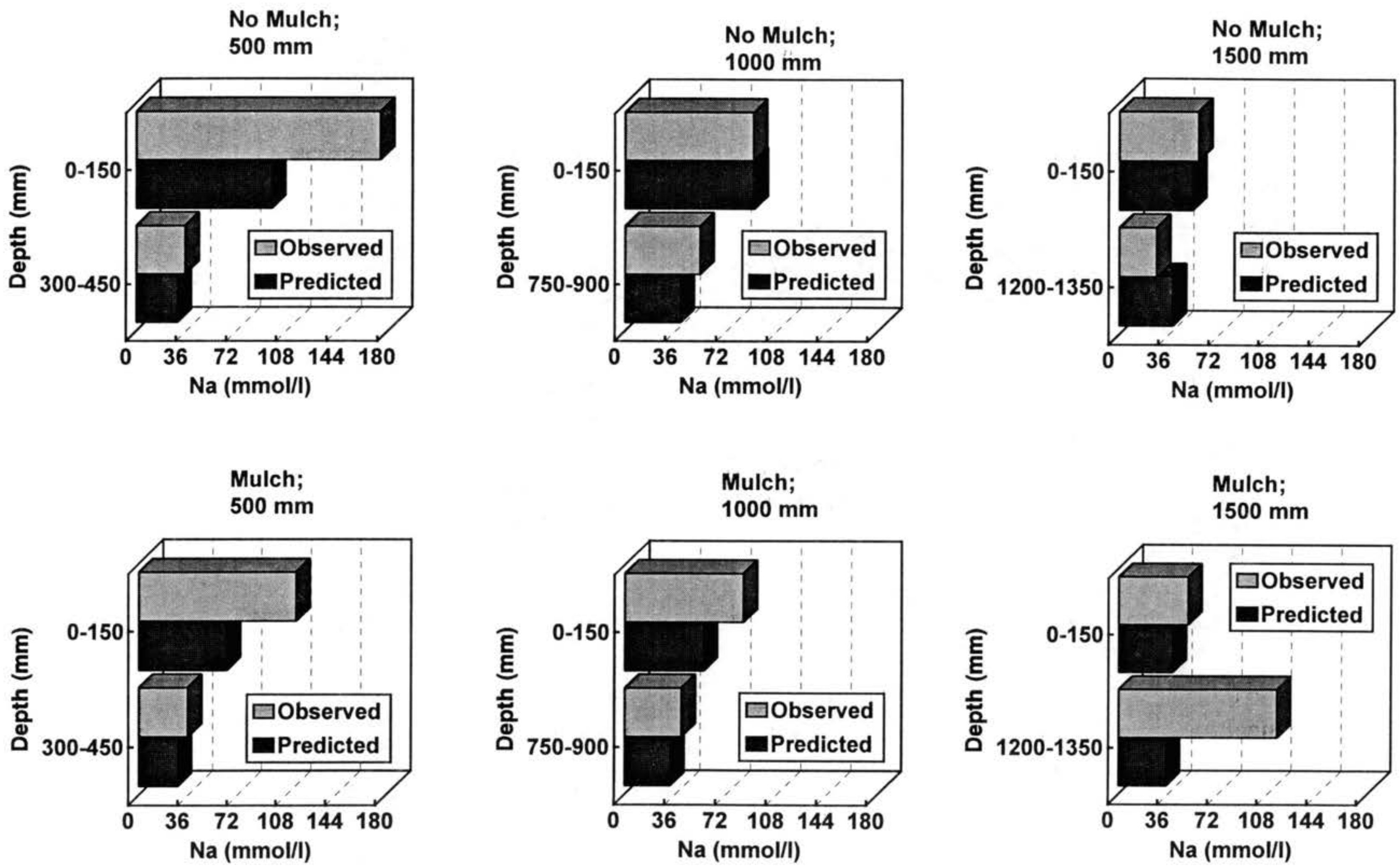


Figure 6. Comparison between Observed and Predicted Na (mmol/l) for Wheat Treatments (2 Mulch Conditions; 3 Water Table Depths)

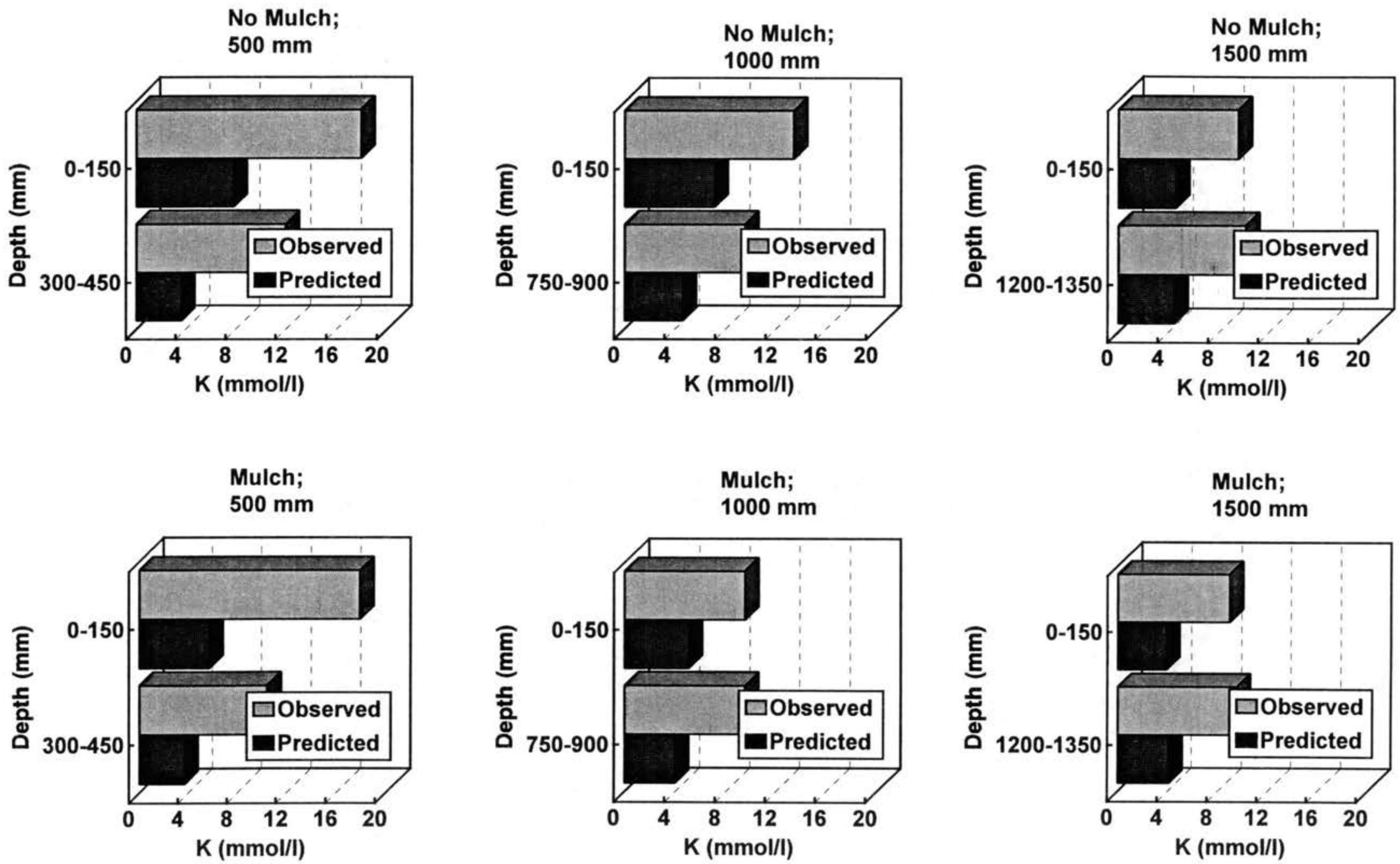


Figure 7. Comparison between Observed and Predicted K (mmol/l) for Wheat Treatments (2 Mulch Conditions; 3 Water Table Depths)

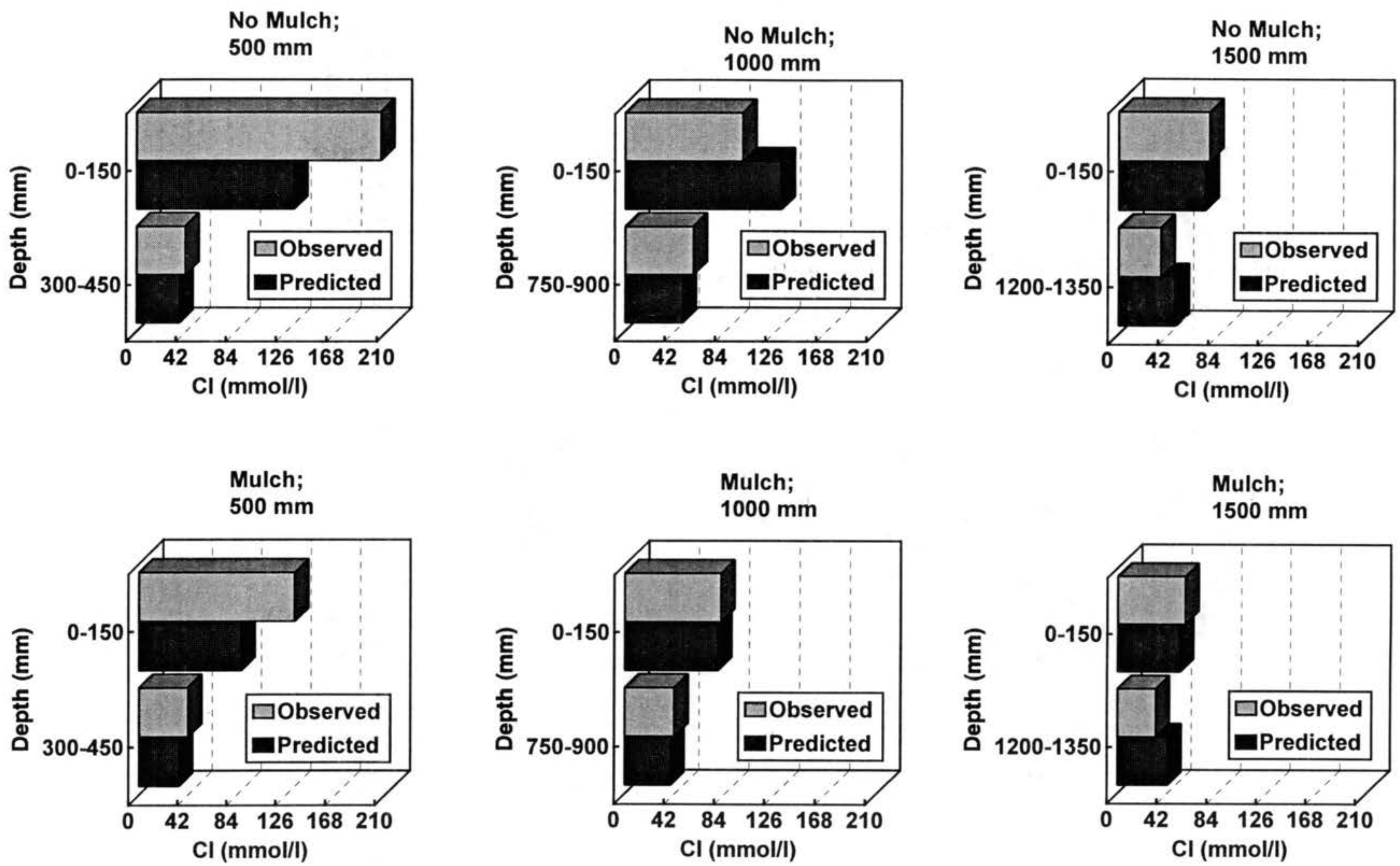


Figure 8. Comparison between Observed and Predicted Cl (mmol/l) for Wheat Treatments (2 Mulch Conditions; 3 Water Table Depths)

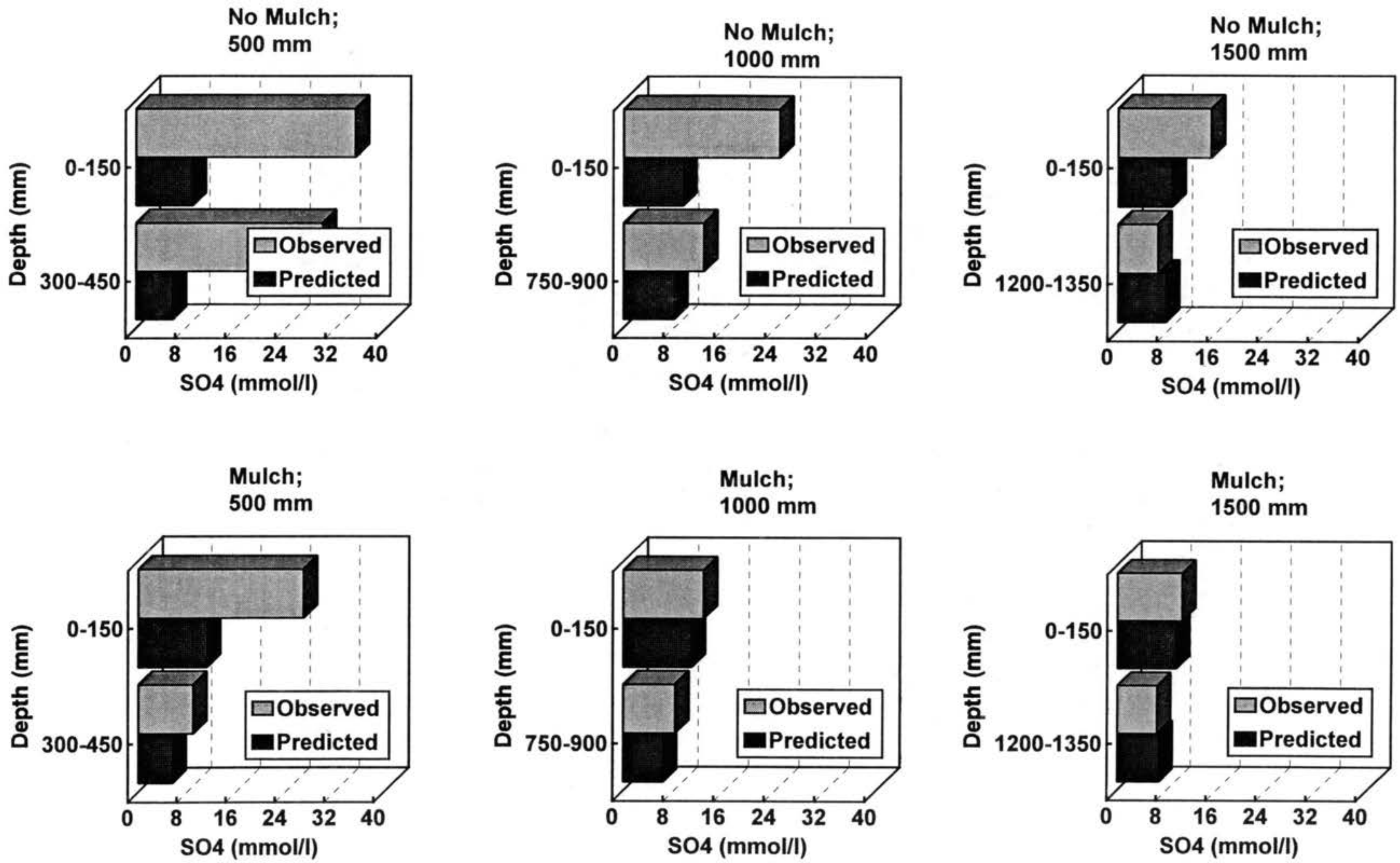


Figure 9. Comparison between Observed and Predicted SO4 (mmol/l) for Wheat Treatments (2 Mulch Conditions; 3 Water Table Depths)

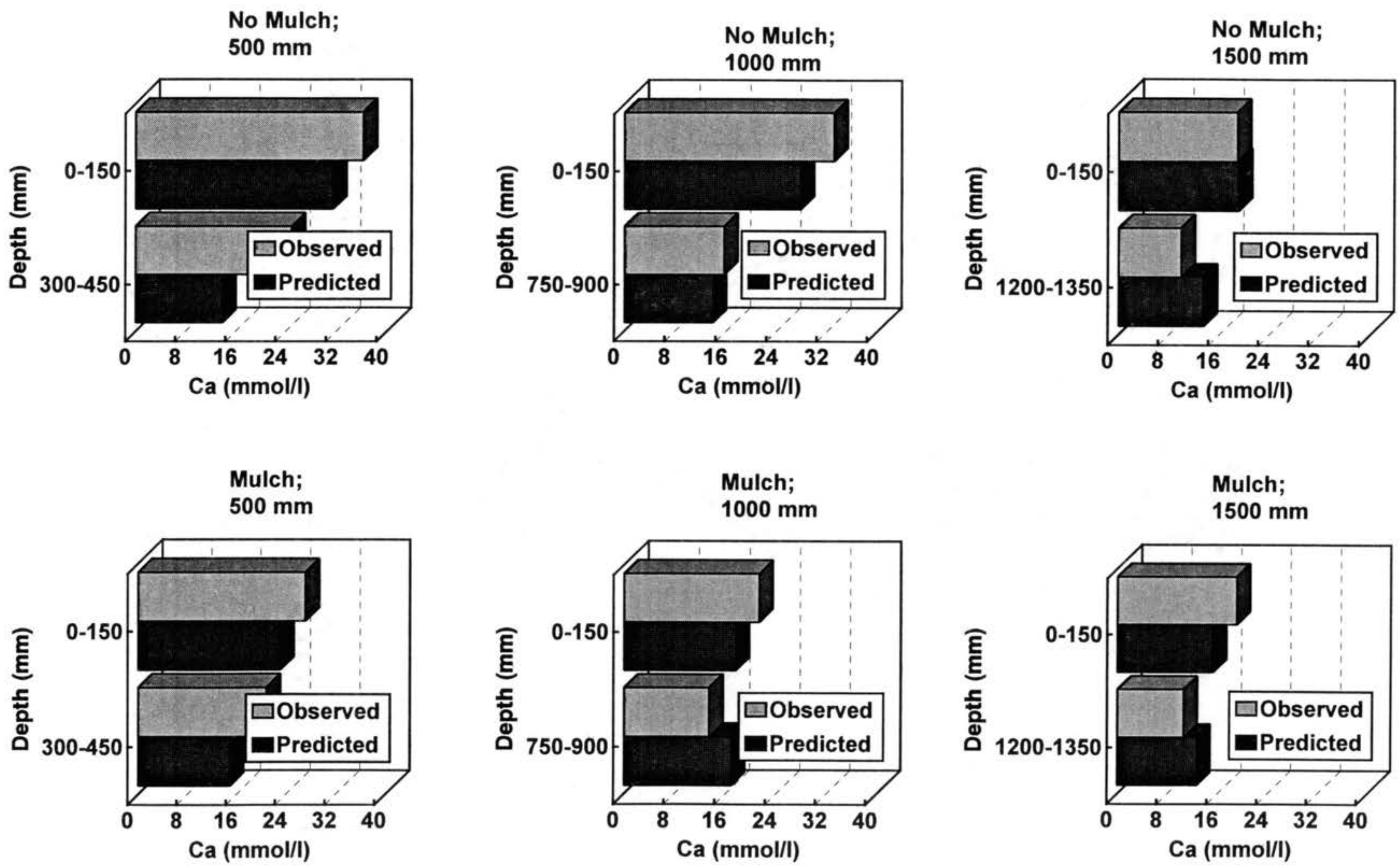


Figure 10. Comparison between Observed and Predicted Ca (mmol/l) for Maize Treatments (2 Mulch Conditions; 3 Water Table Depths)

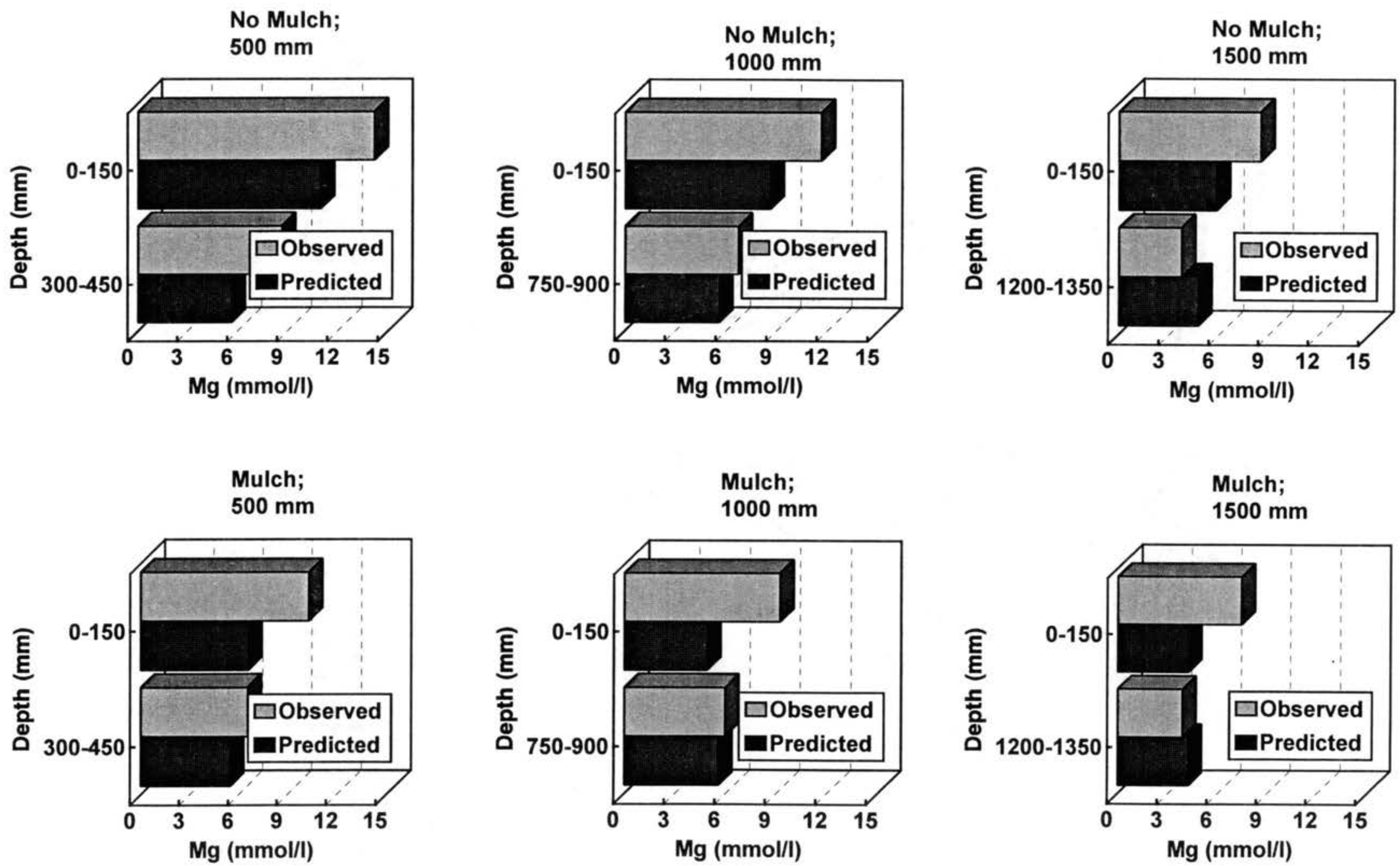


Figure 11. Comparison between Observed and Predicted Mg (mmol/l) for Maize Treatments (2 Mulch Conditions; 3 Water Table Depths)

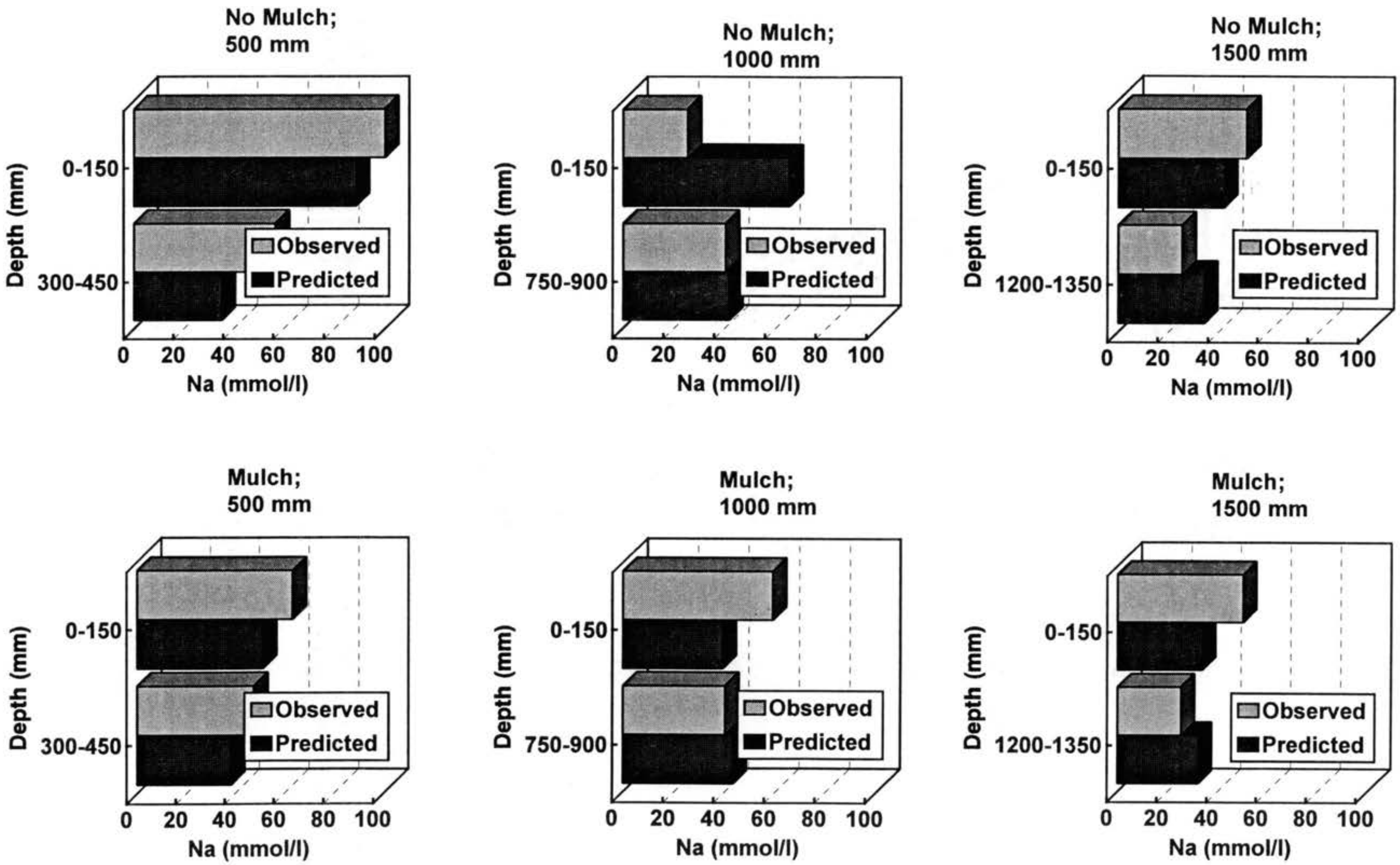


Figure 12. Comparison between Observed and Predicted Na (mmol/l) for Maize Treatments (2 Mulch Conditions; 3 Water Table Depths)

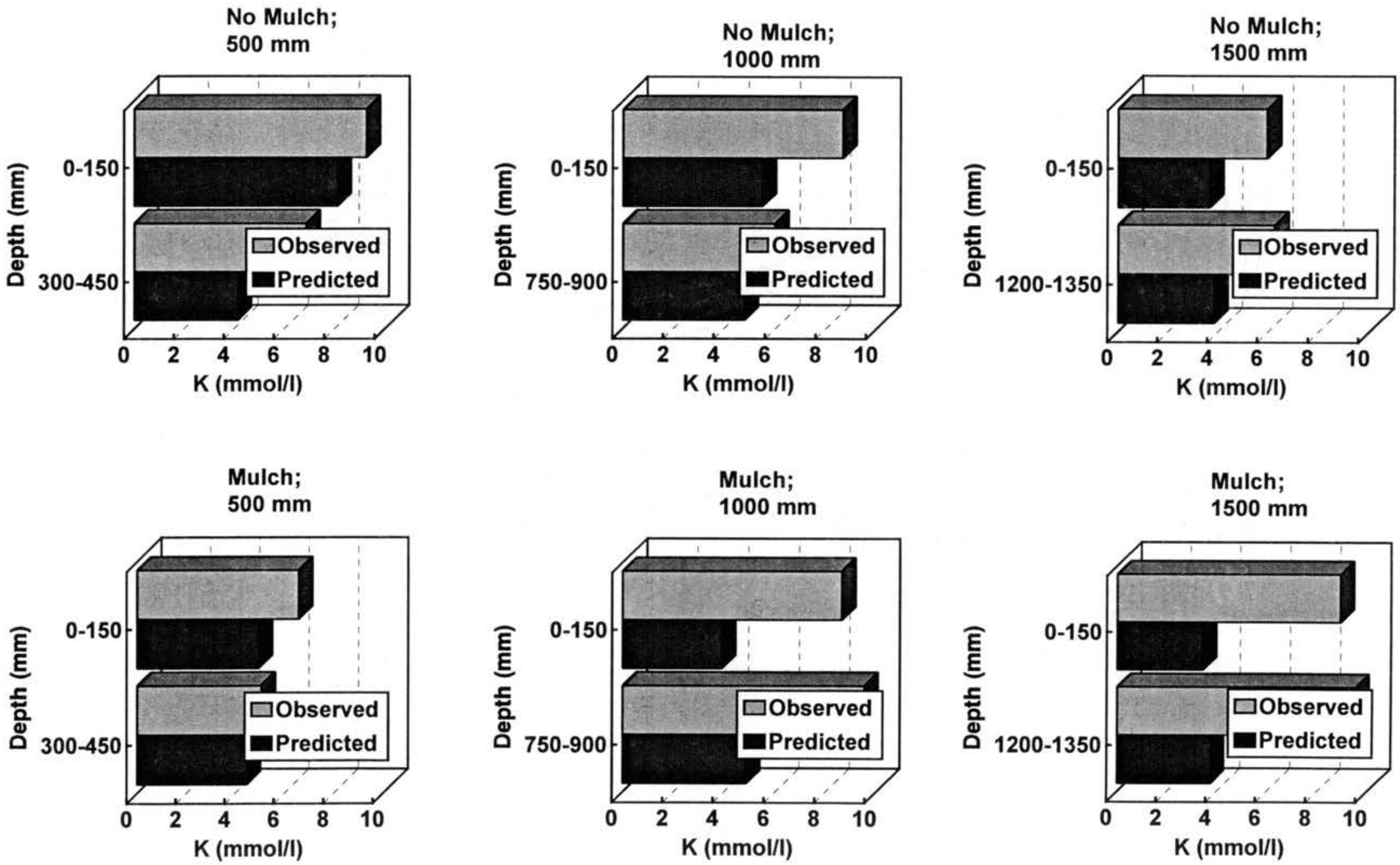


Figure 13. Comparison between Observed and Predicted K (mmol/l) for Maize Treatments (2 Mulch Conditions; 3 Water Table Depths)

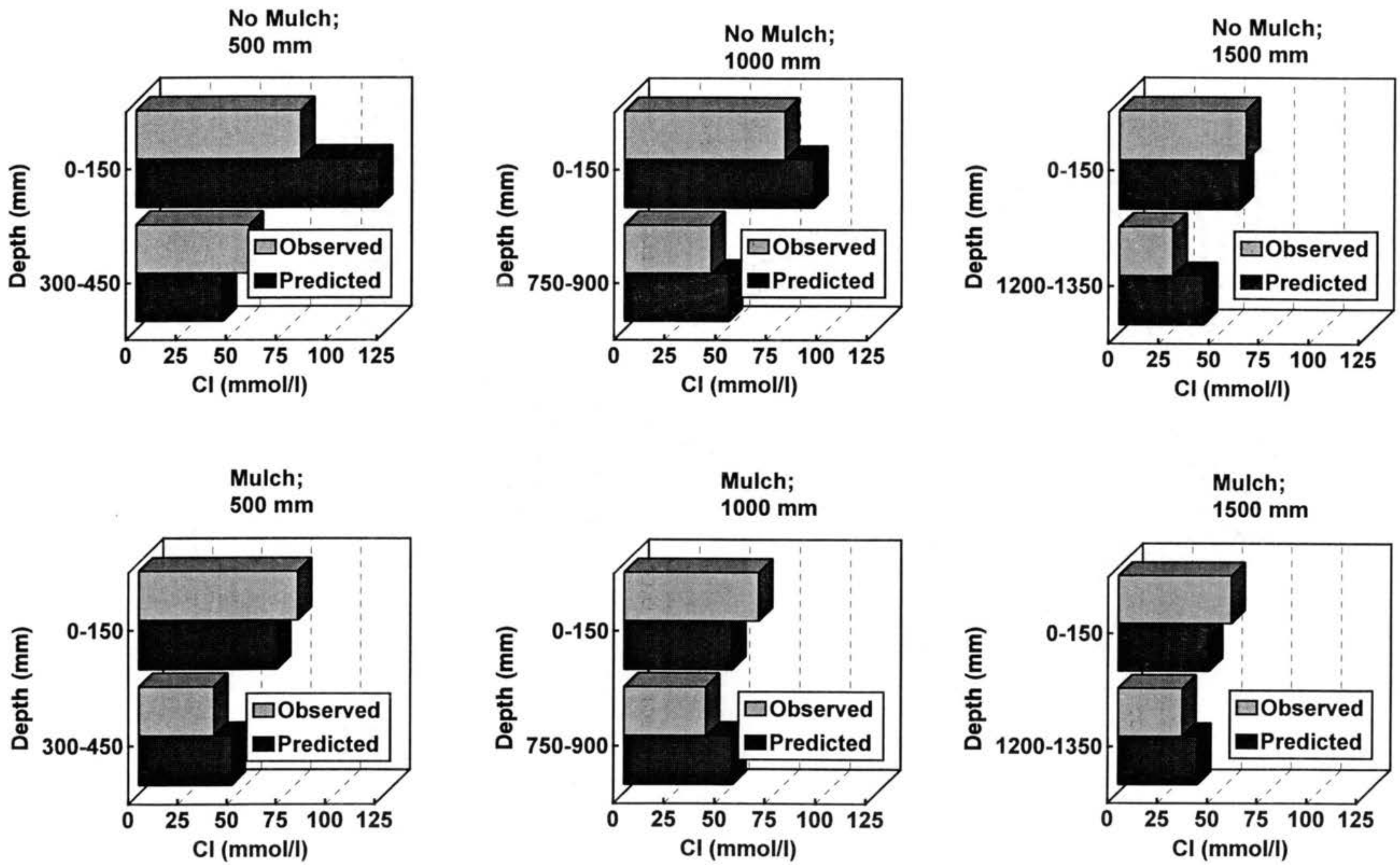


Figure 14. Comparison between Observed and Predicted Cl (mmol/l) for Maize Treatments (2 Mulch Conditions; 3 Water Table Depths)

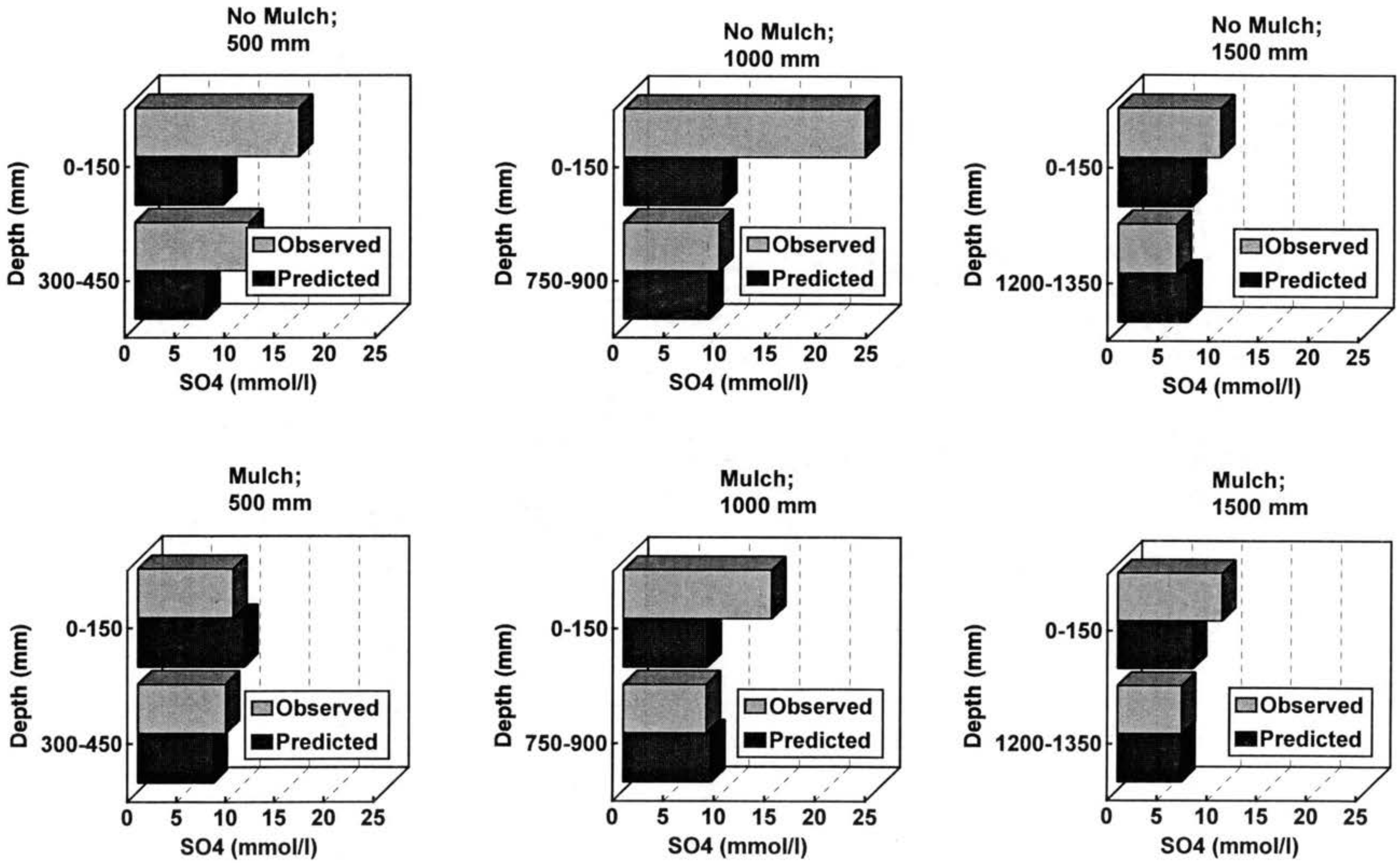


Figure 15. Comparison between Observed and Predicted SO4 (mmol/l) for Maize Treatments (2 Mulch Conditions; 3 Water Table Depths)

and observed concentrations for maize treatments was generally better than for wheat treatments.

The model underpredicted Ca in the surface layer for nearly all treatments, but there was excellent agreement for the 1500 mm treatments (Figures 4 and 10). For these treatments the model tended to slightly overpredict Ca in the deep soil layers.

In all cases, the model underpredicted Mg in the surface layers (Figures 5 and 11). The agreement tended to be poorest in the 500 mm treatments, particularly for wheat . As with Ca, the model slightly overpredicted Mg in the deep layer for the 1500 mm treatments.

Na was predicted reasonably well by the model. The observed Na looked suspicious in a couple of cases, the surface layer in NM100 (Figure 12) and the deep layer in MW150 (Figure 6). The agreement between observed and predicted Na was very good for the deep layers, with slight overpredictions in NW150, NM150, and MM150 (Figures 6 and 12). With the exception of NW050, MW050, NM100, and MM150, there was good agreement in the surface layer. The observed and predicted values were especially close for NW100, NW150, and NM050 (Figures 6 and 12).

In most of the treatments, the agreement between observed and predicted K was poor (Figures 7 and 13). No K was added to the water used to simulate a saline water table. The concentration level in solution suggested its release from minerals due to weathering.

The agreement between predicted and observed Cl was generally quite good (Figures 8 and 14). There was a slight tendency to underpredict in the surface layer and overpredict in the deep layers.

The level of agreement between observed and predicted SO_4 was erratic. It was fairly good in some cases (Figures 9 and 15), and poor in others. Some discrepancy should be expected due to its complex chemistry.

A statistical comparison was also performed for these six ions. The standard error (S_d) of the observed concentrations was compared with the root mean square error (RMSE) of the model predictions. For each ion, both depths and all the treatments were included in the analysis (N = 24). The S_d and RMSE were defined as:

$$S_d=[\frac{\sum (O_i-O_m)^2}{N}]^{\frac{1}{2}} \quad \textbf{(99)}$$

$$RMSE=[\frac{\sum (O_i-P_i)^2}{N}]^{\frac{1}{2}} \quad \textbf{(100)}$$

where O_i and P_i are the observed and predicted concentrations of a particular ion, in a particular treatment and depth, respectively. O_m is the mean of observed concentrations of a particular ion for both depths in all treatments.

For each of six ions, the RMSE was less than S_d (Table

9). The difference was large for all ions except Ca and SO_4.

TABLE 9

STANDARD ERROR AND ROOT MEAN SQUARE ERROR FOR VARIOUS IONS (LYSIMETER DATA)

	Ca	Mg	Na	K	Cl	SO_4
S_d (mmol/l)	13.83	15.40	51.39	14.38	56.28	12.59
RMSE (mmol/l)	9.96	4.87	28.68	5.54	22.08	9.46

Graphical "scatter plots" of predicted versus observed Ca, Mg, K, and SO_4 (Figures 16, 17, and 18) show that these ions were generally underpredicted. In each case, a few data points (usually the surface layer) contributed significantly to the calculated RMSE. The graphs for Na and Cl (Figures 17 and 18) indicate that the predictions were better for these ions. In the case of Na, there was still a tendency for the model to underpredict the observed concentrations.

The measured total ET was also compared with that predicted by the model (Table 10). The predicted ET was quite close to the measured, except for the two unmulched treatments with a 1500 mm water table depth. As noted earlier, soil textural properties were adjusted slightly in the model to ensure that the upward water fluxes matched those measured in the experiments.

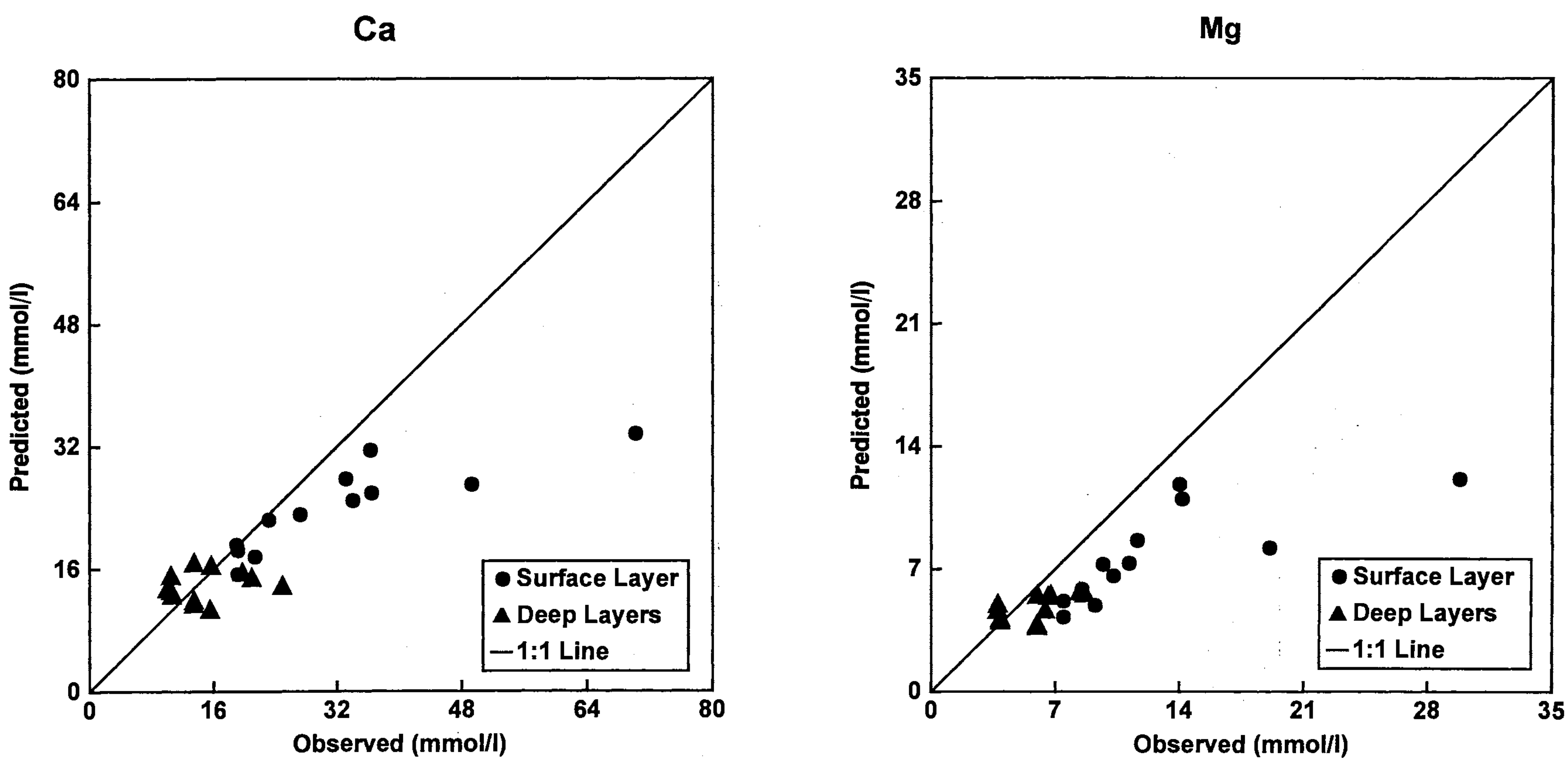


Figure 16. Comparison between Observed and Predicted Ca and Mg (All Treatments; Both Depths)

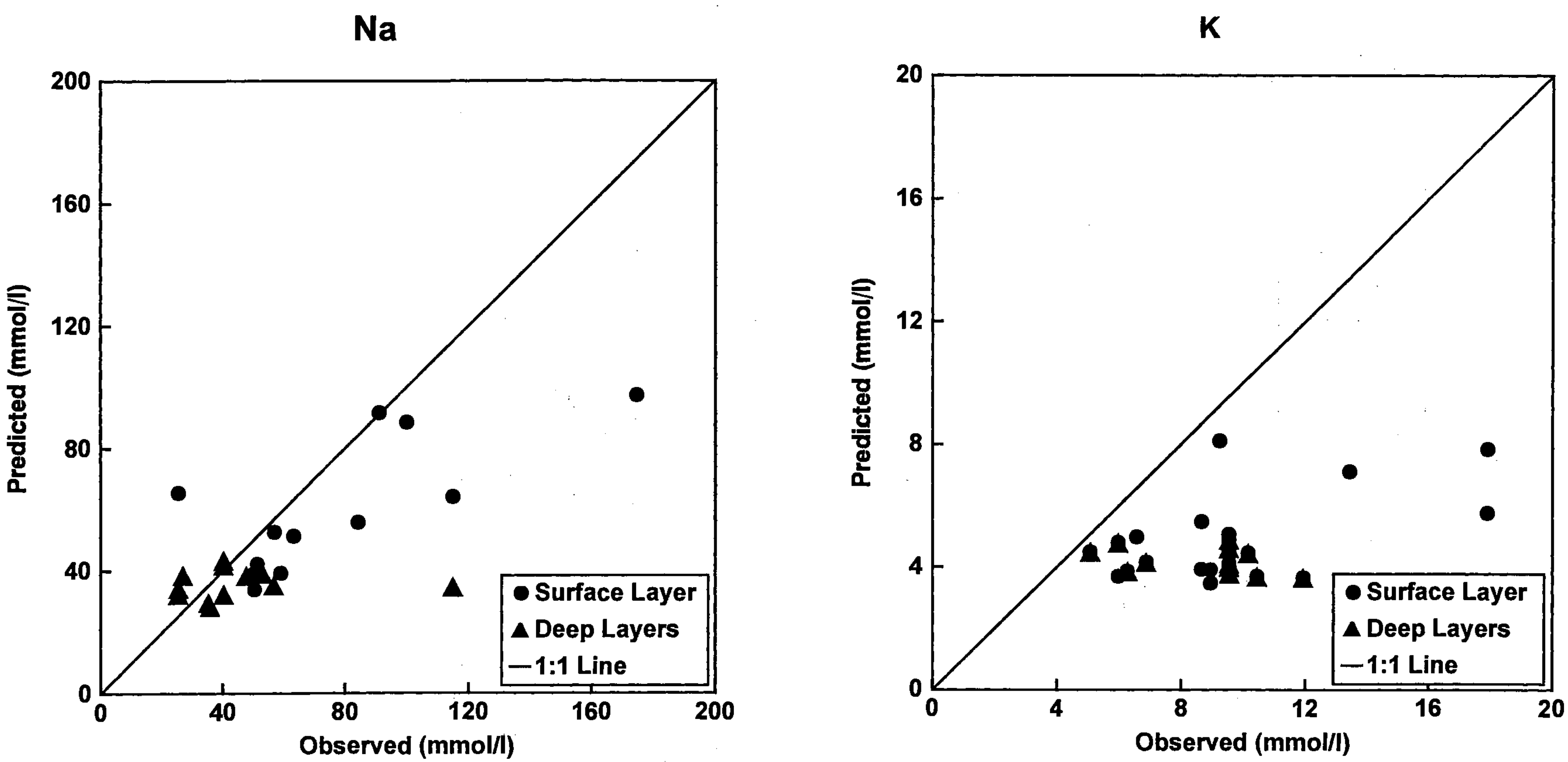


Figure 17. Comparison between Observed and Predicted Na and K (All Treatments; Both Depths)

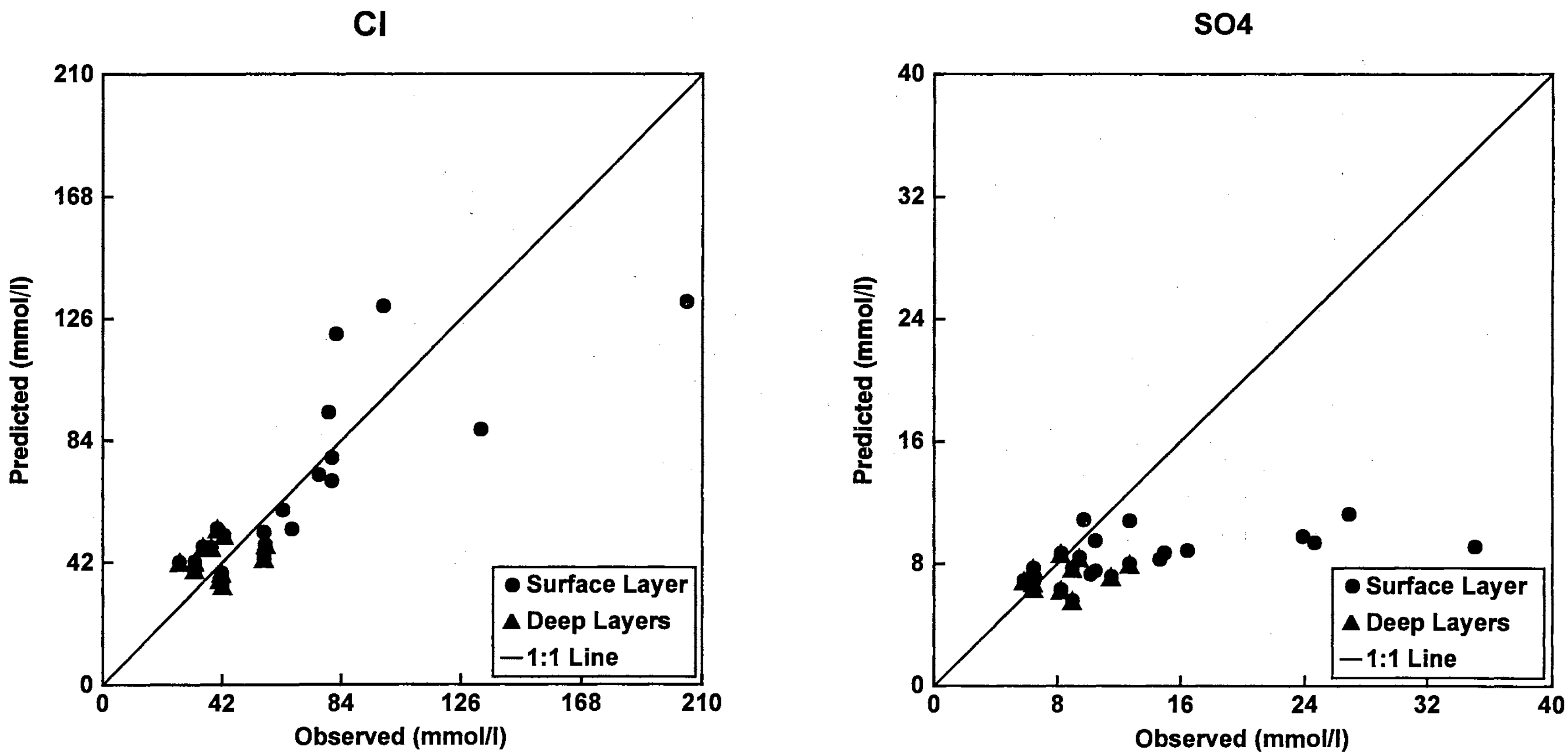


Figure 18. Comparison between Observed and Predicted Cl and SO4
(All Treatments; Both Depths)

TABLE 10

MEASURED AND PREDICTED TOTAL ET IN VARIOUS TREATMENTS

Treatment	Measured ET	Predicted ET
	---mm---	
Wheat		
NW050	414.1	413.9
NW100	445.6	445.7
NW150	312.7	293.2
MW050	241.6	241.5
MW100	241.3	241.1
MW150	175.5	175.4
Maize		
NM050	394.3	394.3
NM100	326.6	326.6
NM150	314.6	277.9
MM050	250.7	250.6
MM100	242.8	242.7
MM150	186.0	186.0

In summary, except for the surface layer in some treatments at shallow water table depths, the agreement between the observed and predicted concentrations of ions was reasonably good. In spite of the fact that some of the input data had to be estimated, the model performed well in predicting the distribution of ions above a shallow water table.

Field Data

Source of Data

The field data used to test LEACHC were obtained from the

Water Management Research Laboratory (WMRL), USDA Agricultural Research Service, Fresno, California (Ayars and Moolman, 1993). WMRL collected these data from two irrigated fields (furrow and drip) at Murrieta Ranch located on the west side of the San Joaquin Valley, California. This experiment, conducted between March 1982 and November 1987, involved two irrigation application methods (furrow and drip), two qualities of irrigation water (good and poor), and three different crops (cotton, wheat, and sugarbeet). The two fields are approximately 600 m apart and are underlain by tile drains. The drains are located at a depth of about 1.7 m on the furrow plot and 2.0 m on the drip irrigated plot.

Input Data

The soil textural composition of the furrow irrigated plot varied between clay loam and loam; for the drip irrigated plot it varied between clay and clay loam (Table 11).

No laboratory analysis was available of the soil water retention curves and other soil-water characteristics. To estimate K-h-θ relations, various retention models are available in LEACHC. The saturated hydraulic conductivity was estimated by noting the water application rate by sprinkler irrigation. An application rate of 150 mm/day did not produce any surface runoff, so it was concluded that the saturated hydraulic conductivity must be of at least that magnitude. A value of 200 mm/day was selected except for the bottom node where it was estimated to be between 1 and 10 mm/day based on drainage rates through the tile drains (Ayars and Moolman, 1993).

TABLE 11

SOIL TEXTURAL COMPOSITION OF FURROW AND DRIP IRRIGATED PLOTS

Depth (mm)	Sand (%)	Silt (%)	Clay (%)	Class
Furrow Irrigated Plot				
300	34.4	26.2	39.4	Clay Loam
600	42.9	25.8	31.3	Clay Loam
900	36.4	27.1	36.5	Clay Loam
1200	44.1	28.7	27.2	Loam
1500	45.6	31.1	23.3	Loam
1800	46.5	31.4	22.1	Loam
Drip Irrigated Plot				
300	29.3	25.0	45.7	Clay
600	25.6	28.7	45.7	Clay
900	21.6	29.8	48.6	Clay
1200	22.8	28.7	48.5	Clay
1500	23.0	35.2	41.8	Clay Loam
1800	24.2	36.6	39.2	Clay Loam

The soil profile was not analyzed for organic matter content. A value of 1.0% was assumed. The bulk density of the soil varied a little with depth and was essentially the same for both plots (Table 12).

A number of soil samples were analyzed during March 1983 for initial chemical composition of the profile. The arithmetic means of these samples served as input to LEACHC after their adjustment from saturated paste to field water content (Table 13).

TABLE 12

BULK DENSITY OF SOIL PROFILE FOR FURROW AND DRIP IRRIGATED PLOTS

	Bulk density (Mg/m^3) at Depth (mm)					
	150	450	750	1050	1350	1650
Furrow Plot	1.30	1.34	1.38	1.40	1.40	1.45
Drip Plot	1.30	1.34	1.38	1.40	1.40	1.50

The cation exchange capacity determined in March 1982 for these plots showed a large variability among the samples. Consequently, the soil samples from both plots were pooled and an average value for each depth was calculated. To determine exchangeable cations, 32 soil samples from all of the Murrieta fields were analyzed and the values averaged (Table 14).

Since the calculated Gapon selectivity coefficients showed only small variability along the soil profile, pooled mean values were used as input to LEACHC (Table 15). The same values were used for both plots.

The furrow plot was irrigated with good quality water, while the drip plot was irrigated with drainage water of poor quality from adjacent fields. Most of the time the furrow plot

TABLE 13

INITIAL CHEMICAL COMPOSITION OF FURROW AND DRIP IRRIGATED PLOTS (SATURATED PASTE)

Depth (mm)	EC (dS/m)	Ca	Mg	Na	K^*	Cl	SO_4	HCO_3
		mmol/l						
Furrow Irrigated Plot								
150	2.80	5.5	1.5	19.3	0.60	4.2	9.0	4.4
450	5.26	5.9	1.8	54.5	0.76	10.4	21.9	4.3
750	8.57	7.9	2.7	81.6	0.25	29.0	30.6	3.3
1050	9.19	8.1	4.1	87.4	0.35	37.3	29.9	3.5
1350	8.22	7.4	3.2	75.0	0.36	34.5	24.6	2.6
1650	7.57	7.7	3.1	74.5	0.36	27.6	34.6	2.6
Drip Irrigated Plot								
50	1.28	6.3	1.6	8.9	0.60	1.5	7.2	4.4
450	2.91	6.9	3.2	30.7	0.76	1.8	25.2	4.3
750	5.38	24.4	7.2	61.7	0.25	8.8	56.8	3.3
1050	5.67	12.9	8.4	63.3	0.35	16.4	54.8	3.5
1350	9.00	25.8	7.2	89.4	0.36	38.3	67.4	2.6
1650	9.00	25.8	7.2	89.4	0.36	38.3	67.4	2.6

* K was taken from the soil chemical analysis done in 1984

was irrigated by flood irrigation and the drip plot was irrigated by drip irrigation. There were a few occasions when the drip plot was irrigated by sprinkler irrigation. Rainfall only in excess of 5 mm was used as input to LEACHC. The dates and amounts of rain and irrigation, along with the chemical composition of the irrigation water, are given in Appendix C.

The water table depth fluctuated between about 1.2 and 2.0 m over the growing season each year (Ayars, 1993; personal communication). To include a fluctuating lower boundary

TABLE 14

EXCHANGEABLE CATIONS AND CATION EXCHANGE CAPACITY OF FURROW AND DRIP IRRIGATED PLOTS

Depth (mm)	Ca	Mg	Na	K	CEC (meq/kg)
	--------mmol(+)/kg			-----------	
Furrow Irrigated Plot					
300	180.8	83.0	23.9	6.3	294
600	152.0	72.6	45.7	6.7	277
900	111.3	57.3	39.2	3.2	211
1200	87.8	53.5	29.4	4.3	175
1500	86.9	50.0	25.1	2.9	165
1800	83.1	46.6	26.4	3.9	160
Drip Irrigated Plot					
300	183.4	79.3	16.1	15.2	294
600	141.4	84.1	38.8	12.7	277
900	117.2	56.2	35.7	1.9	211
1200	80.9	57.8	33.8	2.4	175
1500	87.8	40.8	34.6	1.8	165
1800	83.4	38.9	35.4	1.9	160

TABLE 15

GAPON'S SELECTIVITY COEFFICIENTS FOR MURRIETA RANCH SOIL (AVERAGE)

K1 (Mg/Ca)	K2 (Ca/Na)	K3 (Ca/K)	K4 (Mg/K)	K5 (Mg/Na)	K6 (K/Na)
0.84	4.07	0.30	0.24	2.85	16.04

condition in LEACHC, precise information with respect to depth to water table during each week would be required. Since this information was not available, a fixed water table lower boundary condition was used for both the plots. A value of 1.75 m was used to represent the depth to water table for both plots. No data were available on the chemical composition of the ground water. The flow from tile drains was comprehensively analyzed in 1987; in prior years it was analyzed for EC and Cl only. From the time series of EC values, an average estimate was obtained for each plot, and then the composition of other ions was determined based on that average EC value and the complete analysis done in 1987. The chemical compositions used for a fixed water table boundary condition for the furrow and drip irrigated plots are given in Table 16.

TABLE 16

WATER TABLE CHEMICAL COMPOSITION FOR FURROW AND DRIP IRRIGATED PLOTS

Plot	EC (dS/m)	Ca	Mg	Na	K	Cl	SO_4
		mmol/l					
Furrow	6.75	24.0	12.0	32.0	0.15	29.0	39.0
Drip	8.50	23.5	13.0	60.0	0.18	30.0	66.0

The same crops (cotton, wheat, sugarbeet) were grown on both plots during the experimental period except for 1987. In that year, cotton was grown on the drip plot only. The crop rotation cycle and pertinent dates required as input to LEACHC are given in Table 17.

TABLE 17

CROPS GROWN IN BOTH PLOTS AND THEIR DATES OF PLANTING, EMERGENCE, ETC.

Crop	Dates of				
	Planting	Emergence	Root Maturity	Plant Maturity	Harvest
Cotton	050383	051383	073183	080783	101583
Cotton	040984	041984	071084	070184	111084
Wheat	121484	010785	031585	030185	061785
Sugarbeet	100385	101785	042186	032086	082086
Cotton*	041687	043087	071587	072287	112387

* drip plot only

Crop coefficients were used to convert the available pan evaporation data to actual evapotranspiration (ET). Actual ET used as input for the simulation period is given in Appendix C. Since the crops were the same for both plots, the same ET was used as input with the exception that the ET data after August 1986 were applicable only to the drip irrigated plot. A crop cover fraction at maturity of 0.90 was used for each crop.

The data described above were used as input to LEACHC. The period of simulation was from May 1, 1983 to November 30, 1987 for the drip plot and from May 1, 1983 to August 31, 1986 for the furrow plot. The output obtained from these simulations is discussed in the following section.

Results and Discussion

The volumetric water content profile was measured in the field several times throughout the study period. Six dates were chosen at random to graphically compare the measured and predicted water contents (Figures 19 and 20). Since representative observed water content data were not available after July 1984 for both the plots, only predicted water content profiles are reported after July 1984. The measured and predicted water contents for both plots are tabulated in Appendix D. There was better agreement between measured and predicted values for the furrow irrigated plot than for the drip plot. In the drip plot (Figure 19), there was good agreement except during October 1983. The predicted water contents under drip irrigation were relatively constant with both depth and time. In the case of the furrow plot (Figure 20), the agreement between observed and predicted water content was very good. It can be concluded that the model performed well in predicting water content profiles above a saline shallow water table.

Chemical analysis of the soil profile was conducted periodically throughout the study period. For the drip irrigated field, data were available on 8 occasions from 1984 to 1987. For the furrow irrigated plot, sampling was done on

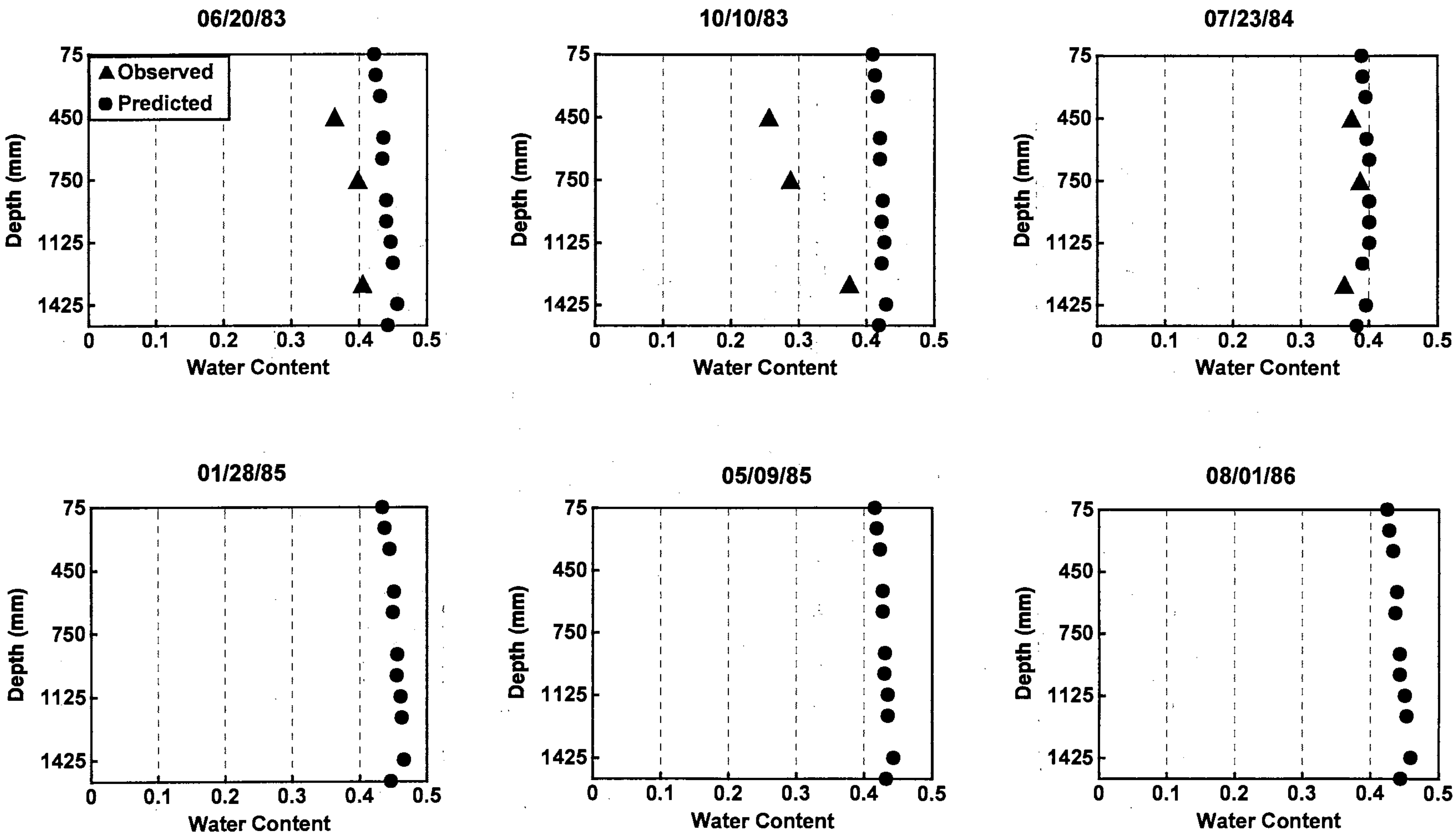


Figure 19. Comparison between Observed and Predicted Volumetric Water Content at Various Times (No Representative Observed Data after July 1984; Drip Plot)

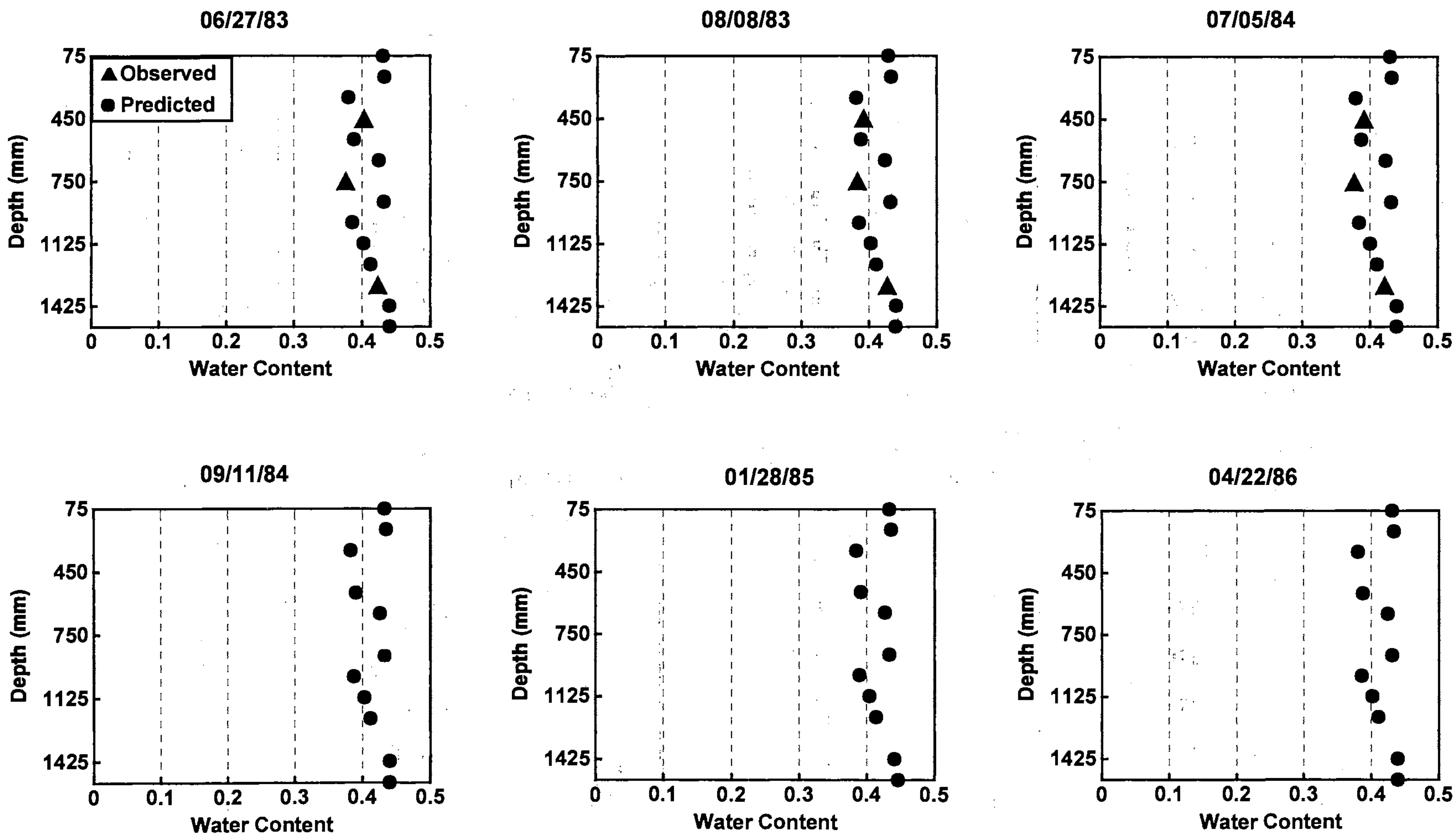


Figure 20. Comparison between Observed and Predicted Volumetric Water Content at Various Times (No Representative Observed Data after July 1984; Furrow Plot)

4 occasions from 1984 to 1986. The measured and predicted ion concentrations at different times are presented in Appendix D for both the plots. Figures 21, 22, 24, 25, 27, and 28 provide the comparisons between measured and predicted Ca, Mg, Na, Cl, SO_4, and EC, for the drip irrigated plot. Figures 23, 26, and 29 compare measured and predicted Ca, Mg, Na, Cl, SO_4, and EC, for the furrow irrigated plot.

Generally the agreement between measured and predicted ion concentrations was better in the drip irrigated plot than in the furrow irrigated plot. On all dates (except spring 1984 in the case of drip plot) and for both the plots, Ca was underpredicted by the model (Figures 21 and 23). The predicted Ca profiles were quite constant throughout the simulation. The observed Ca profiles did not show any consistent trend. It may be that the chemistry of carbonates and sulfates is too complex to be explained successfully by simple processes.

With Mg, there tended to be better agreement between measured and predicted values during the spring of the year (Figures 22 and 23). Almost without exception, the model overpredicted Mg in the drip plot (Figure 22). A few measured Mg values seemed suspicious such as during the spring of 1985 when the measured Mg profile indicated a 0 value (Figure 22).

Mg was predicted better by the model than was Ca. Although the model was not able to predict either of these ions with a high level of accuracy, Ca and Mg were not the dominant ions with respect to their contribution towards soil salinity. Uncertainty in water table composition, selectivity

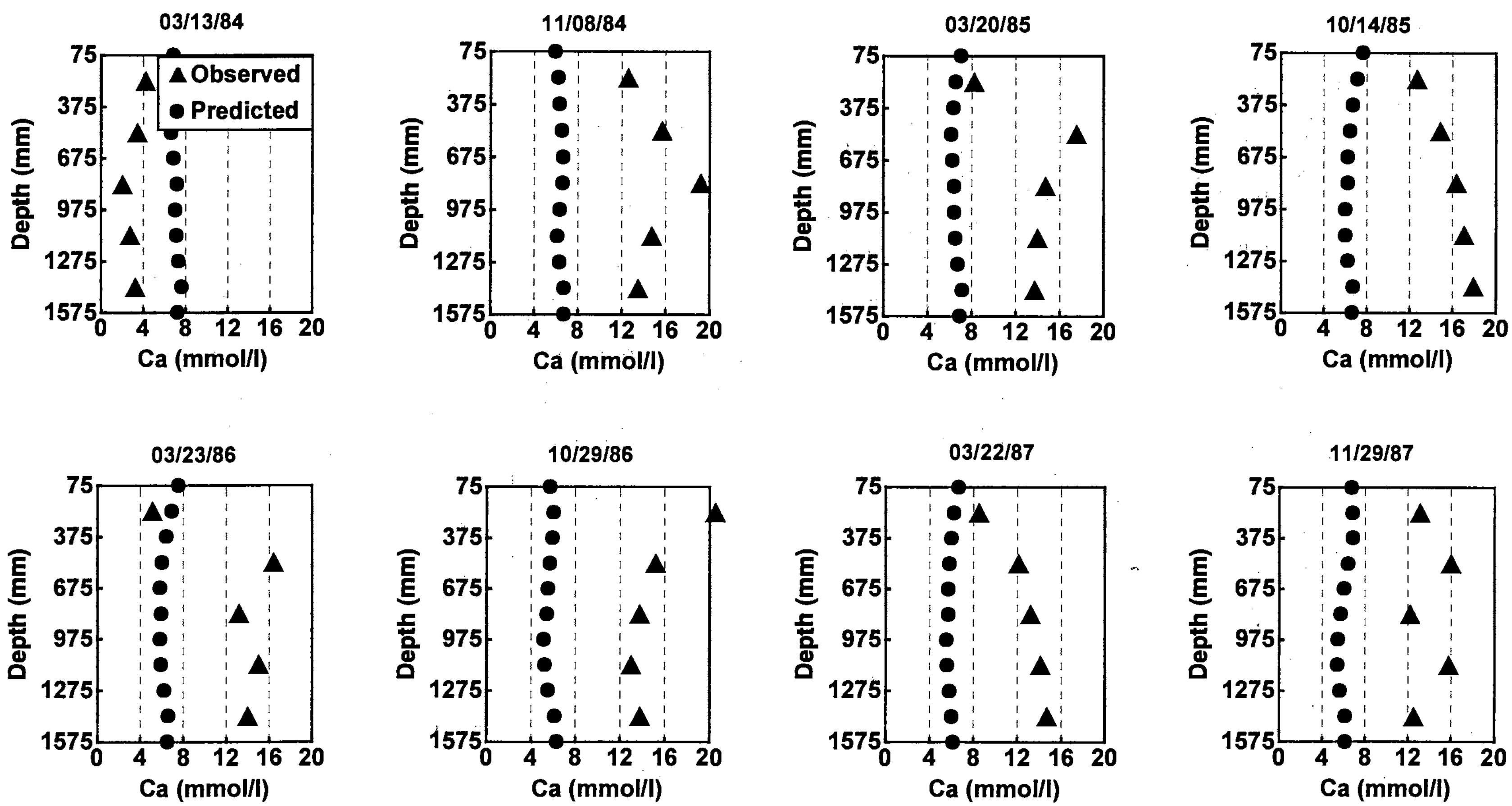


Figure 21. Comparison between Observed and Predicted Ca at 8 Times (Drip Plot)

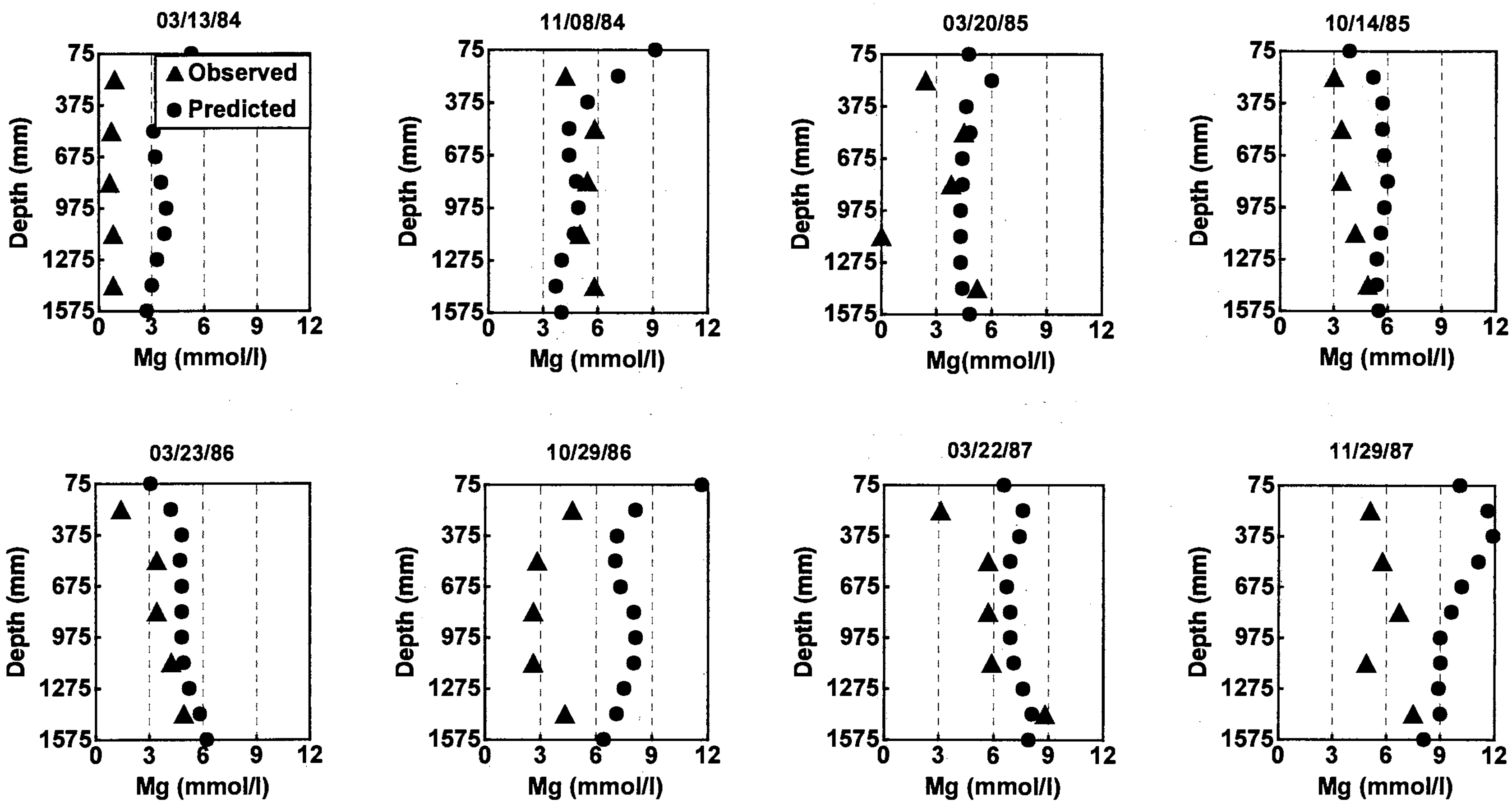


Figure 22. Comparison between Observed and Predicted Mg at 8 Times (Drip Plot)

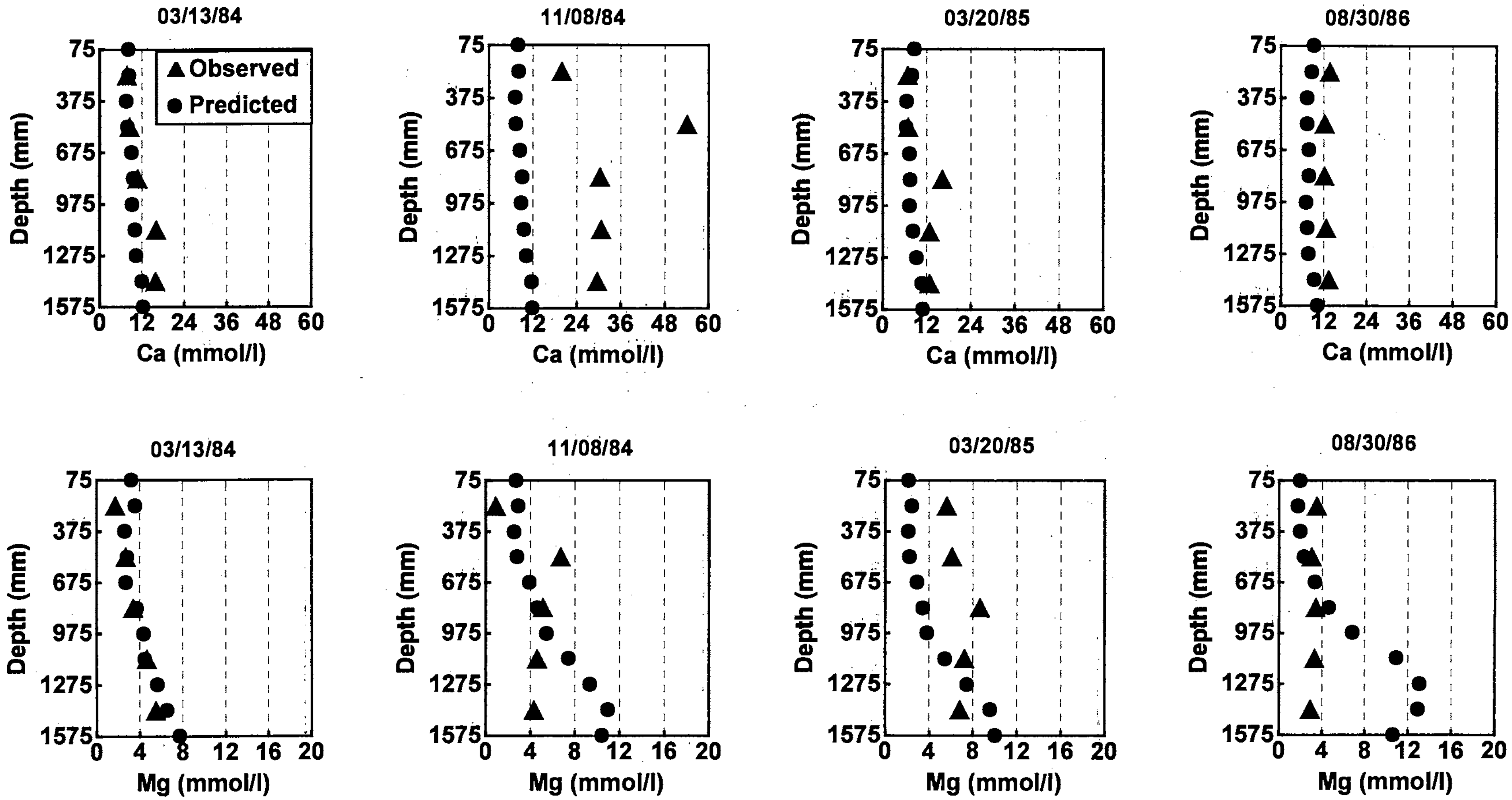


Figure 23. Comparison between Observed and Predicted Ca and Mg at 4 Times (Furrow Plot)

coefficients, and solubility products, and the complex chemistry of these ions, might be contributing factors.

Measured and predicted Na profiles agreed quite well except during the spring of 1984 (Figure 24 and 26). There tended to be a consistent difference in the shape of the spring and fall profiles; this can be partially attributed to rainfall and irrigation patterns. The model seemed to simulate well the rather large gradients in Na with depth.

The trends in Cl profiles were similar to those for Na (Figures 25 and 26). Measured and predicted Cl concentrations again agreed rather well. In the drip plot, Cl concentrations in the deeper layers were at times underpredicted. Two of the values observed in March 1985 seemed unexpectedly high (one each in the drip and furrow plots).

Overall there was good agreement between observed and predicted SO_4 in the drip plot (Figure 27), with the best match occurring in the 1985 observations. The greatest discrepancy was near the beginning of the simulation period. In the furrow plot (Figure 29), the model tended to significantly underpredict SO_4 concentrations.

Except for the first date (spring 1984), the model predicted EC very well in the drip plot (Figure 28). In fact the agreement was better than majority of the individual ions in either plot. In the furrow plot, agreement between observed and predicted EC was reasonably good (Figure 29). There was some evidence of overprediction in the deeper soil layers. Because Na and Cl were the dominant ions and were predicted

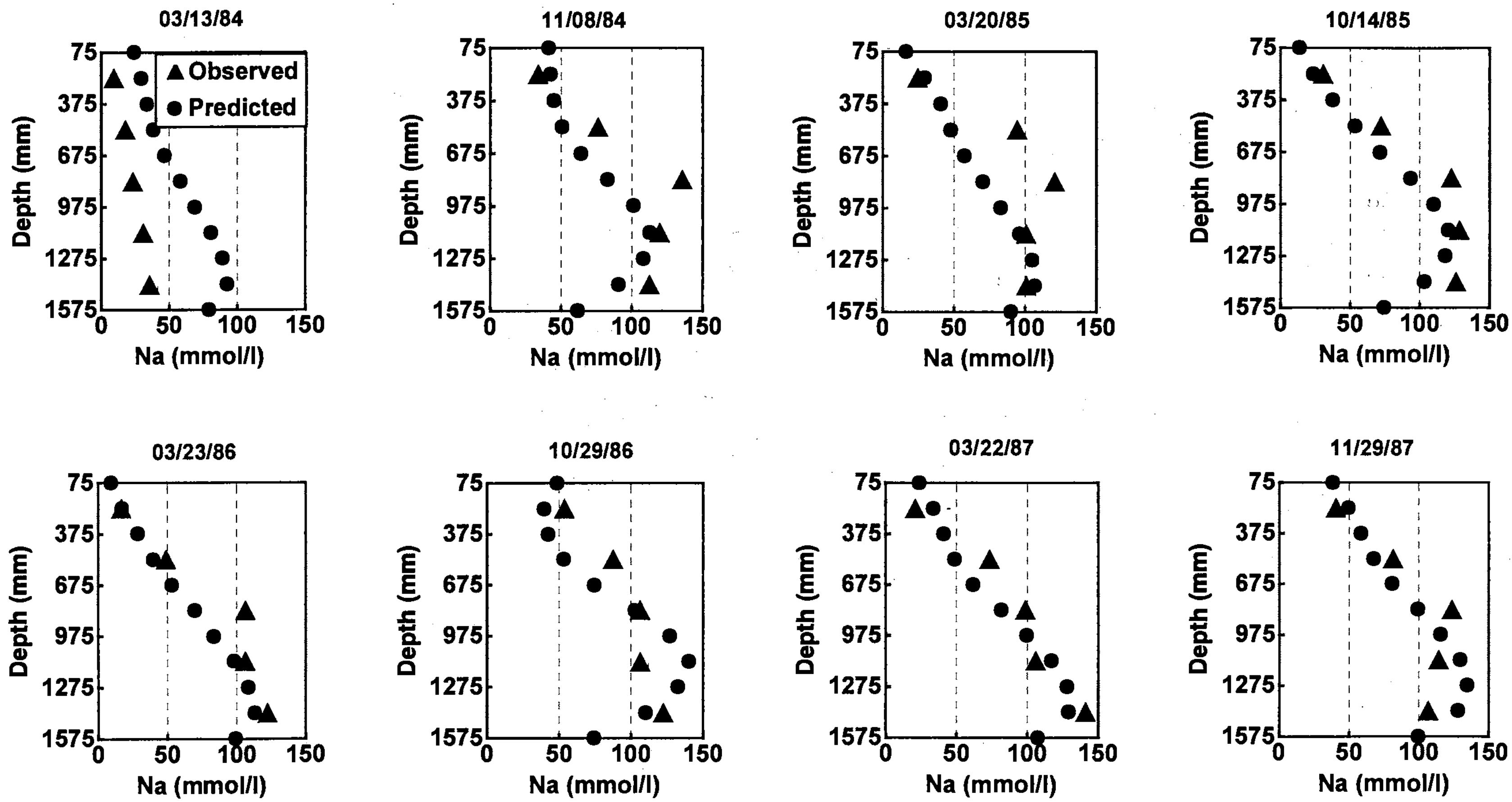


Figure 24. Comparison between Observed and Predicted Na at 8 Times (Drip Plot)

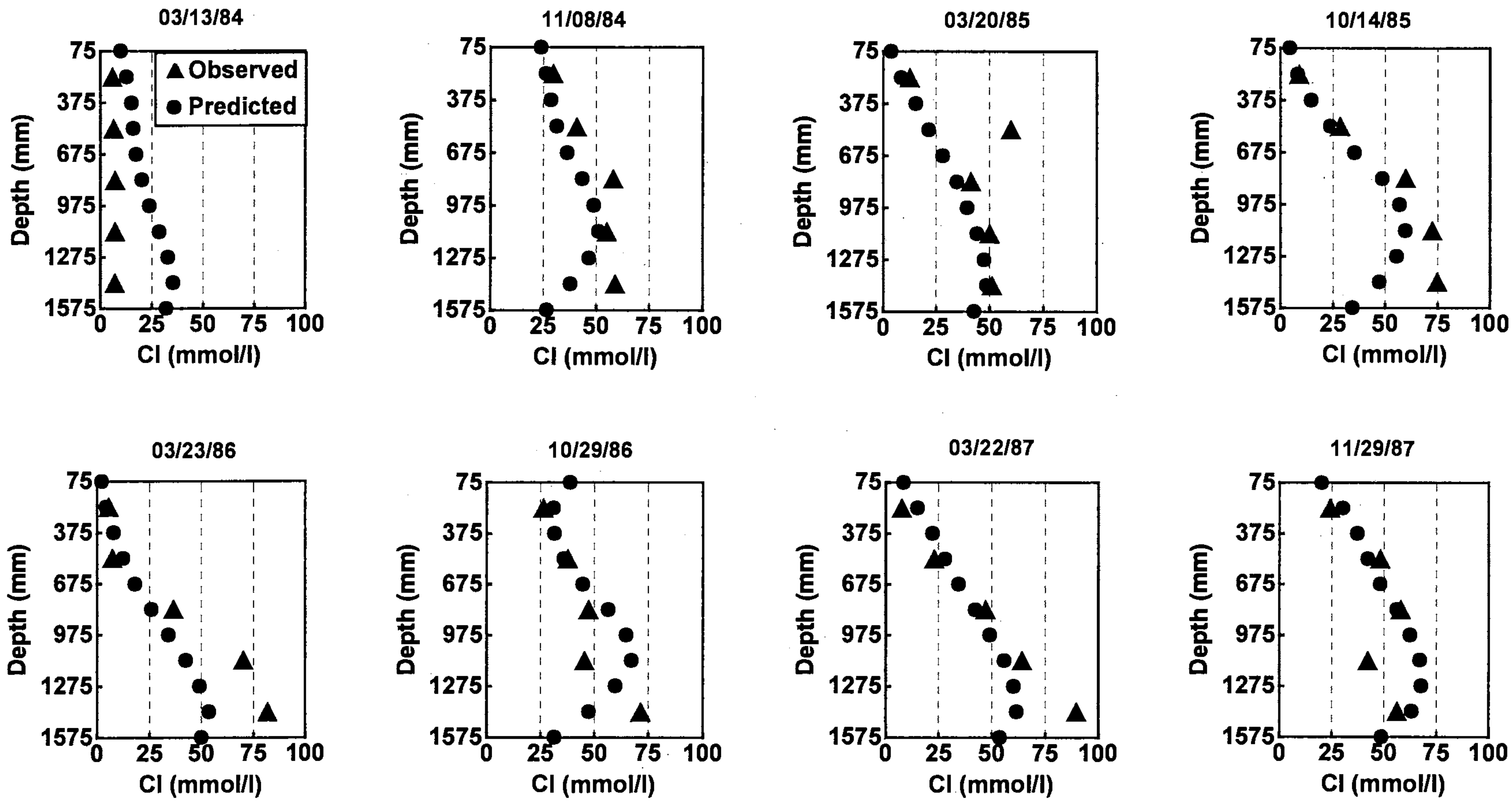


Figure 25. Comparison between Observed and Predicted Cl at 8 Times (Drip Plot)

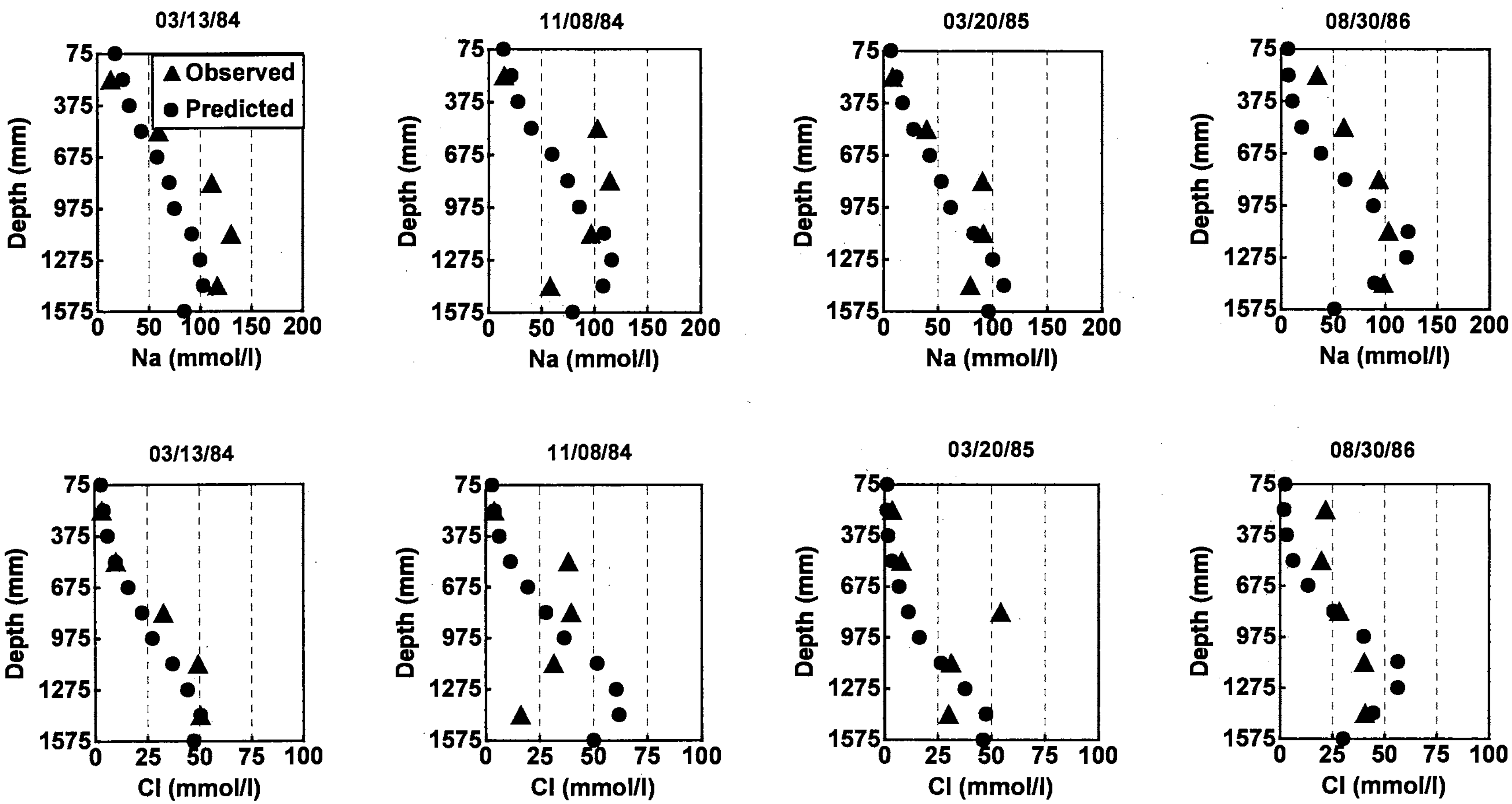


Figure 26. Comparison between Observed and Predicted Na and Cl at 4 Times (Furrow Plot)

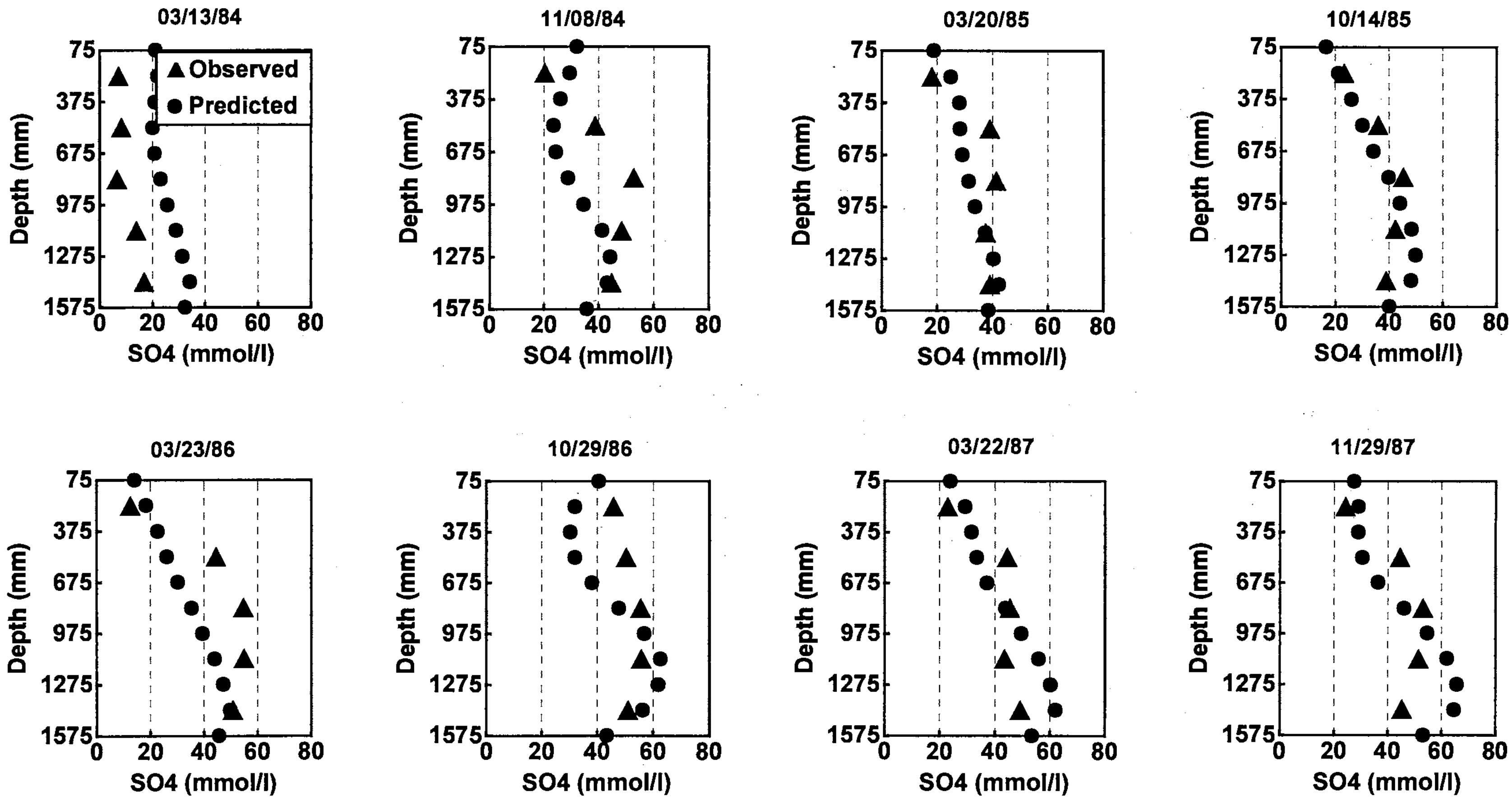


Figure 27. Comparison between Observed and Predicted SO4 at 8 Times (Drip Plot)

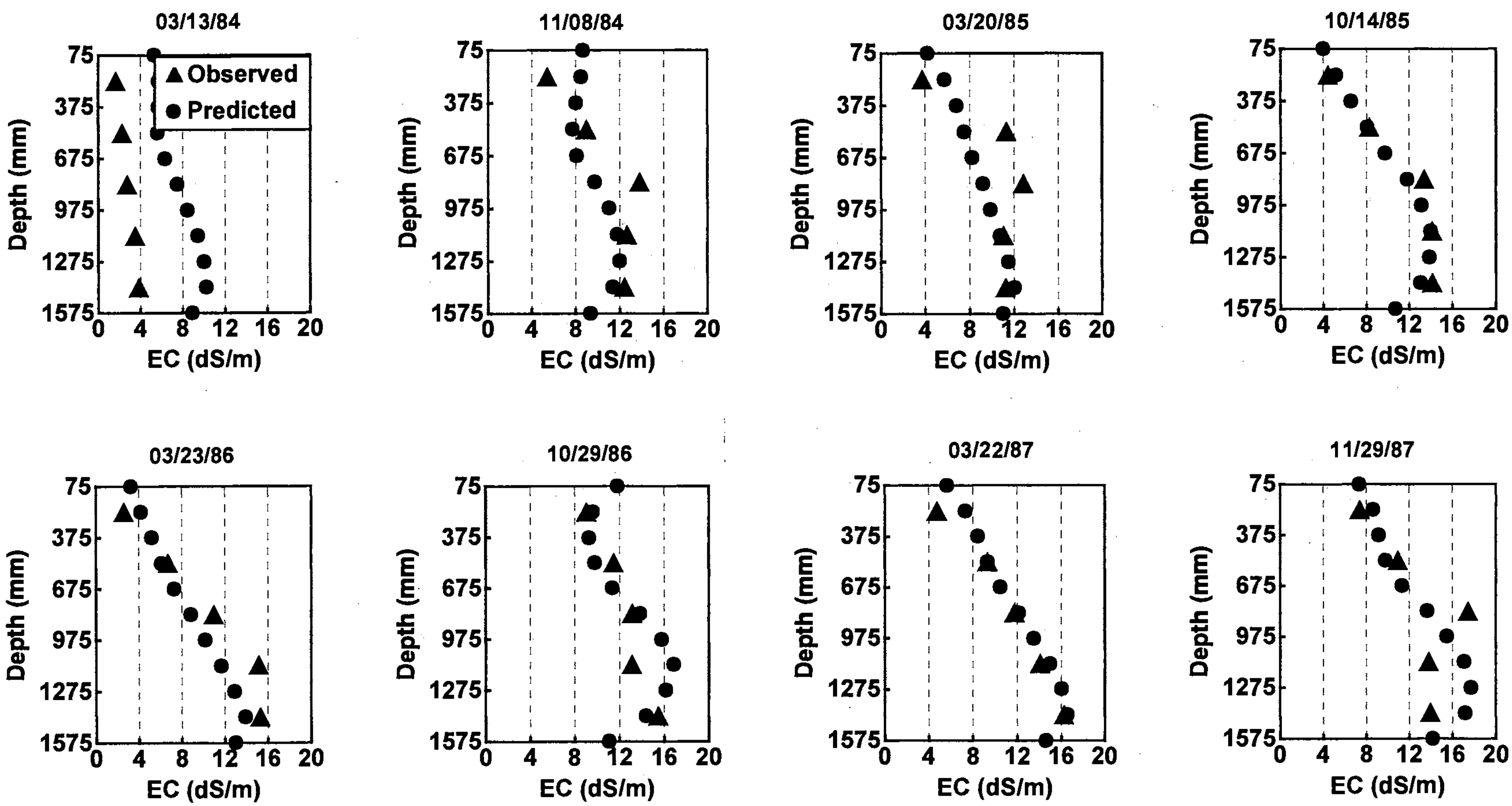


Figure 28. Comparison between Observed and Predicted EC at 8 Times (Drip Plot)

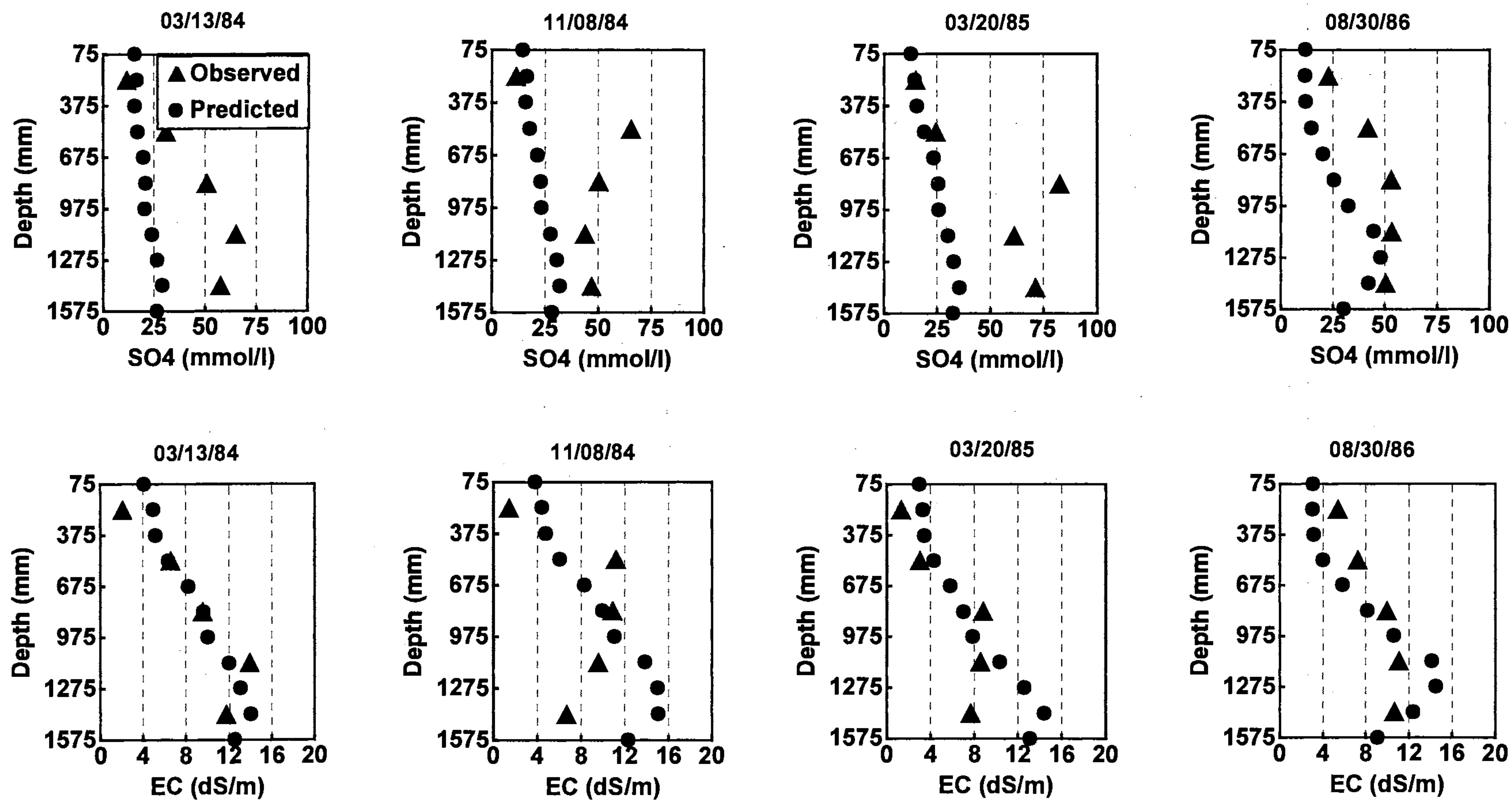


Figure 29. Comparison between Observed and Predicted SO4 and EC at 4 Times (Furrow Plot)

well, EC was also predicted well.

For the furrow plot, Ayars and Moolman (1993) indicated that the data on irrigation amounts during 1985 and 1986 may have been somewhat suspect. Ion concentrations tended to be better predicted in the drip plot than in the furrow plot. Also, the model predictions for the furrow plot tended to be best early in the study period (March 1984). This was in sharp contrast to the results for the drip plot.

For the sake of statistical comparison, observed and predicted means of ion concentrations, RMSE, and d-index were compared for each ion, depth, and plot. The d-index was defined as (Willmott, 1981):

$$d = 1 - \left[\frac{\sum_{i=1}^{N} (P_i - O_i)^2}{\sum_{i=1}^{N} [|P_i'| + |O_i'|]^2} \right] \qquad \textbf{(101)}$$

where

$$P_i' = P_i - O_m$$

$$O_i' = O_i - O_m$$

where P_i and O_i are the ith predicted and observed ion concentrations (at a particular depth and time), respectively. O_m is the mean of all observed values at a particular depth for a particular ion. The value of N was 8 for the drip irrigated plot and 4 for the furrow irrigated plot.

In the drip irrigated plot (Table 18), predicted means

(P_m) were generally less than observed means (O_m), although there were exceptions (especially Mg). The differences were rather large in the case of Ca. For Ca and Mg ions, RMSE values were relatively large when compared with O_m and d-index values were relatively small. The differences between O_m and P_m for Na, Cl, SO_4 and EC were relatively small, as were the RMSE values. The values of d-index for these ions were consistently greater than 0.60. Cl and EC were predicted especially well as reflected by their high d-index values.

In the case of the furrow irrigated plot, all ions were predicted rather poorly as indicated by relatively large differences between O_m and P_m, relatively large RMSE's, and low d-index values (Table 19). Poor agreement between observed and predicted ions in the case of the furrow irrigated plot can be partially attributed to some deficiencies in input data.

Summary

Considering the estimates and assumptions which had to be made in developing the input data sets, and recognizing the inherent inaccuracies in modeling complex processes, LEACHC performed well in simulating solute transport above a shallow water table. The model was tested in two diverse settings, a lysimeter study in India and a field study in California. In both cases, multiple treatments were imposed. Based on these results it seems valid to apply LEACHC as a simulation tool for analyzing salinity in crop root zones above a shallow water table.

TABLE 18

OBSERVED AND PREDICTED MEANS, RMSE, AND d-INDEX OF ION CONCENTRATIONS (DRIP PLOT)

Ion	Depth (mm)	O_m	P_m	RMSE	d-index
		-----mmol/l	---------		
Ca	225	10.6	6.6	6.5	0.44
	525	13.9	6.2	8.9	0.37
	825	13.1	6.1	8.5	0.34
	1125	13.3	6.0	8.7	0.31
	1425	12.9	6.7	7.6	0.32
Mg	225	3.1	6.8	3.9	0.28
	525	4.0	6.0	2.8	0.32
	825	3.9	6.0	2.7	0.49
	1125	3.3	5.9	3.2	0.47
	1425	5.1	5.8	1.8	0.80
Na	225	28.6	32.8	11.1	0.68
	525	68.9	49.8	26.7	0.63
	825	104.5	82.1	34.7	0.64
	1125	105.6	111.7	26.9	0.63
	1425	110.0	109.1	26.3	0.59
Cl	225	15.0	16.8	4.8	0.92
	525	31.4	26.3	14.9	0.70
	825	44.3	40.8	9.9	0.86
	1125	50.8	51.9	18.1	0.63
	1425	61.4	49.9	10.9	0.71
SO_4	225	21.7	25.6	8.9	0.66
	525	38.2	27.9	13.9	0.59
	825	44.3	36.9	13.6	0.71
	1125	43.4	47.4	9.6	0.81
	1425	42.0	49.9	10.9	0.71
EC (dS/m)	225	4.9	6.8	2.2	0.74
	525	8.6	8.0	2.0	0.79
	825	12.0	10.8	3.1	0.73
	1125	12.2	13.3	3.0	0.69
	1425	12.8	13.6	2.7	0.77

TABLE 19

OBSERVED AND PREDICTED MEANS, RMSE, AND d-INDEX OF ION CONCENTRATIONS (FURROW PLOT)

Ion	Depth (mm)	O_m	P_m	RMSE	d-index
		-----mmol/l---------			
Ca	225	12.0	8.1	6.5	0.47
	525	20.4	7.2	23.5	0.45
	825	17.4	8.4	11.8	0.45
	1125	18.0	8.7	11.5	0.49
	1425	17.9	10.8	9.5	0.50
Mg	225	2.9	2.6	2.3	0.02
	525	4.6	2.5	2.8	0.49
	825	5.1	4.2	2.7	0.23
	1125	4.9	7.4	4.2	0.06
	1425	4.9	10.3	6.3	0.22
Na	225	17.5	15.9	15.7	0.19
	525	65.3	32.5	38.6	0.48
	825	102.4	64.4	38.2	0.39
	1125	105.4	101.2	23.0	0.38
	1425	87.9	102.7	30.8	0.31
Cl	225	8.1	2.6	10.1	0.41
	525	18.9	7.5	15.3	0.53
	825	38.5	21.6	22.9	0.31
	1125	37.9	42.7	14.6	0.35
	1425	34.2	51.0	24.6	0.35
SO_4	225	15.2	14.7	6.6	0.01
	525	40.5	17.0	28.4	0.42
	825	59.2	23.6	37.7	0.38
	1125	55.8	31.4	27.4	0.33
	1425	56.5	34.4	24.6	0.35
EC (ds/m)	225	2.5	3.9	2.6	0.16
	525	7.0	5.2	3.1	0.53
	825	9.8	8.7	1.4	0.62
	1125	10.8	12.6	2.9	0.41
	1425	9.8	13.9	5.6	0.36

CHAPTER IV

MODEL APPLICATION

After testing its performance under saline shallow water table conditions, LEACHC was used to investigate the influence of water table depth, water table chemical composition, irrigation strategy, soil type, and crop type on the accumulation and distribution of salts in the soil profile, and on relative crop yield. Selected for simulations were three water table depths (1000, 1500, and 2000 mm), two levels of water table salinity (electrical conductivity (EC) of 2 and 6 dS/m), four different irrigation strategies [14 days irrigation interval with (a) irrigation application amount equal to 0.75 of estimated ET 14(0.75), (b) irrigation application amount equal to 0.50 of estimated ET 14(0.50); and 4 days irrigation interval with (a) irrigation application amount equal to 0.75 of estimated ET 4(0.75), (b) irrigation application amount equal to 0.50 of estimated ET 4(0.50)], two soil types (sandy loam and clay loam), and two crops (cotton and wheat). There were 96 treatments all together (3 water table depths x 2 salinity levels x 4 irrigation strategies x 2 soil types x 2 crops). The numbering scheme for the treatments is given in Table 20. Either cotton or wheat was grown continuously for a three-year simulation period.

TABLE 20

TREATMENT DESCRIPTION AND NUMBERING (MODEL APPLICATION)

Water Table Depth		1000 mm								1500 mm								2000 mm							
Water Table EC		EC1 (2 dS/m)				EC2 (6 dS/m)				EC1 (2 dS/m)				EC2 (6 dS/m)				EC1 (2 dS/m)				EC2 (6 dS/m)			
Irrigation Interval		14 Days		4 Days		14 Days		4 Days		14 Days		4 Days		14 Days		4 Days		14 Days		4 Days		14 Days		4 Days	
Irrigation Application Amount (% of ET)		.75	.5	.75	.5	.75	.5	.75	.5	.75	.5	.75	.5	.75	.5	.75	.5	.75	.5	.75	.5	.75	.5	.75	.5
ST2 (Clay Loam)	CT2 (Wheat)	13	14	15	16	29	30	31	32	45	46	47	48	61	62	63	64	77	78	79	80	93	94	95	96
	CT1 (Cotton)	9	10	11	12	25	26	27	28	41	42	43	44	57	58	59	60	73	74	75	76	89	90	91	92
ST1 (Sandy Loam)	CT2 (Wheat)	5	6	7	8	21	22	23	24	37	38	39	40	53	54	55	56	69	70	71	72	85	86	87	88
	CT1 (Cotton)	1	2	3	4	17	18	19	20	33	34	35	36	49	50	51	52	65	66	67	68	81	82	83	84
Soil Type	*Crop Type*																								

Input Data

The textural composition and bulk densities of the two soils (sandy loam and clay loam) are given in Table 21. The characteristics of the sandy loam soil were quite similar to those of the soil reported in the lysimeter study, and the characteristics of the clay loam soil were identical to those used in simulations of the drip and furrow irrigated plots (chapter 3). The soil profiles were assumed to be uniform with depth.

TABLE 21

TEXTURAL COMPOSITION AND BULK DENSITIES OF SOILS

Soil Type	Sand (%)	Silt (%)	Clay (%)	Bulk Density (Mg/m3)
Sandy Loam	60	20	20	1.35
Clay Loam	38	26	36	1.35

The saturated hydraulic conductivities were assigned to be 290 mm/day and 150 mm/day for the sandy loam and clay loam, respectively. Organic matter content was 1.0% for the sandy loam and 2.0% for the clay loam.

The same initial chemical composition of the soil profile (Table 22) was used for all treatments. The concentration of various ions was assumed uniform throughout the soil profile.

The selected initial chemical composition corresponds to an EC of 2.1 dS/m. This relatively low salinity level was selected to minimize the possibility of unrealistically high EC values developing during the simulation period, especially for treatments with a high EC for the underground water.

TABLE 22

INITIAL CHEMICAL COMPOSITION FOR BOTH SOILS

EC(dS/m)	Ca	Mg	Na	K	Cl	SO_4
	mmol/l					
2.10	1.70	0.70	13.00	0.75	6.10	6.10

The same cation exchange capacity and exchangeable cations (Table 23), and selectivity coefficients (Table 24), were used for both soils. The cation exchange capacity of 150 mmol/kg soil is toward the lower end for a clay loam soil and toward the higher end for a sandy loam soil. The same values were assumed for both soils in order to eliminate any impact of CEC on solution cations.

Two different water table chemical compositions were used for all three fixed water table depths. These compositions, corresponding to two salinity levels, are presented in Table 25.

An irrigation amount equal to 0.50 or 0.75 of the

TABLE 23

EXCHANGEABLE CATIONS AND CATION EXCHANGE CAPACITY FOR BOTH SOILS

Ca	Mg	Na	K	CEC
----------------mmol/l-----------				(mmol/kg soil)
83.1	46.6	12.4	7.9	150.0

TABLE 24

SELECTIVITY COEFFICIENTS FOR BOTH SOILS

K1 (Mg/Ca)	K2 (Ca/Na)	K3 (Ca/K)
0.84	4.08	0.30

TABLE 25

WATER TABLE CHEMICAL COMPOSITION (TWO LEVELS)

EC	Ca	Mg	Na	K	Cl	SO_4
(dS/m)	--------------------mmol/l---------------------					
EC1						
2.0	5.0	2.5	8.0	0.19	8.0	5.0
EC2						
6.0	21.7	9.2	34.5	0.49	21.0	43.4

estimated cumulative ET was applied every 4 or 14 days to all the treatments. The water used for irrigation had the same chemical composition as that used in chapter 3's furrow plot simulations (field data; Appendix C), and is comparable to water used in the Westlands Irrigation District in California. By using irrigation water with a low salt content in the simulations, any change in salinity of the soil profile can comfortably be attributed to a saline shallow water table.

Cotton was selected as one of the crops because it is relatively salt tolerant. Wheat was selected mainly because it is one of the major crops grown in Pakistan under high salinity conditions (despite the fact that it is somewhat salt sensitive). The dates of planting, emergence, root and plant maturity, and harvesting were taken from Ayars and Moolman (1993). Three years of relevant information were available for the cotton crop. For wheat, dates were available for only one year, but were assumed to be the same for the other two years of the simulation period. The ET data for these crops were extracted from information (Appendix C) provided by Ayars and Moolman (1993). Again, for wheat single-year ET data were applied to the other two years. A crop cover coefficient of 0.9 was used for each crop.

Results and Discussion

Concentrations of individual ions, exchangeable sodium percentage (ESP), sodium adsorption ratio (SAR), electrical conductivity (EC), and dissolved cations of the soil profile are presented for all 96 treatments in Appendix E. These model results are also available on computer diskette from the Department of Biosystems and Agricultural Engineering, Oklahoma State University, Stillwater. For each treatment it required about six hours of computer time (PC 486/25 MHz) to complete the three-year simulation period.

In order to compare the trends of individual ions and the EC over time, results from treatments 17-20, 49-52, and 81-84 (Table 20) were plotted in Figures 30-35. These treatments represent three water table depths and four irrigation strategies. In each case the soil type is sandy loam, the crop is cotton, and the electrical conductivity (EC) of the water table is 6 dS/m. Except for Ca, all ions and the EC tended to steadily increase with time. Ca tended to increase early in the simulation period and then level off. For Mg, Na, Cl, SO_4, and EC, the trends over time were quite consistent. As expected, the maximum average concentration of ions in the soil profile was obtained at a water table depth of 1000 mm. The average ionic concentrations decreased substantially when the water table was maintained at 1500 mm, and still further for a 2000 mm water table depth.

Because the EC of the soil profile is directly related to total dissolved salts, the concentration patterns of individual ions were very similar to the EC pattern. Therefore it is reasonable to use the average EC of the soil profile for drawing various conclusions related to salt movement and concentrations. Also it should be remembered the agreement

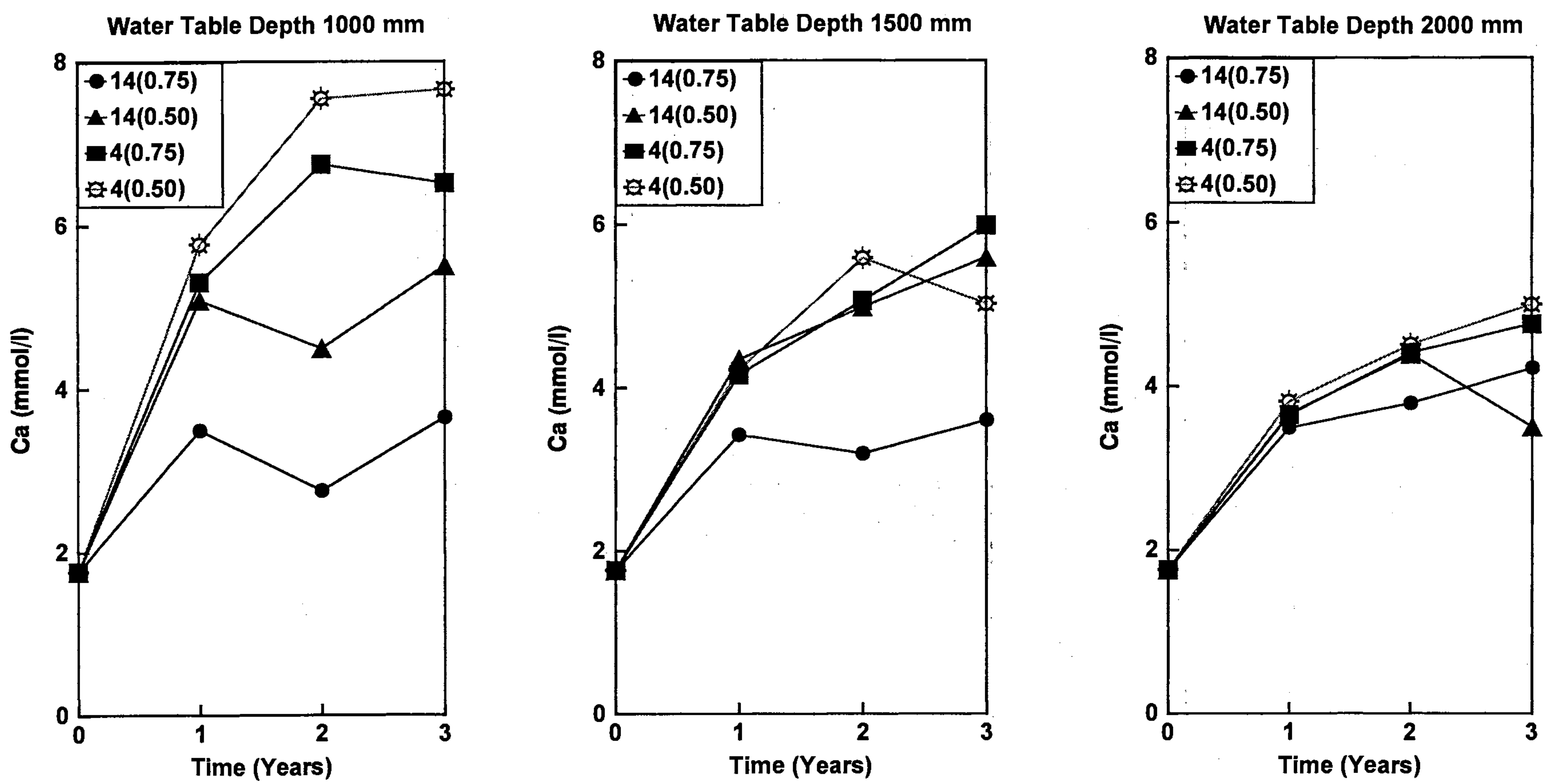


Figure 30. Predicted Average Ca of the Soil Profile for 4 Irrigation Strategies (4 and 14 days as Irrigation Intervals; 0.75 and 0.50 of ET as Irrigation Application Amounts) and 3 Water Table Depths (Sandy Loam Soil; Cotton Crop; Electrical Conductivity of Water Table 6 dS/m)

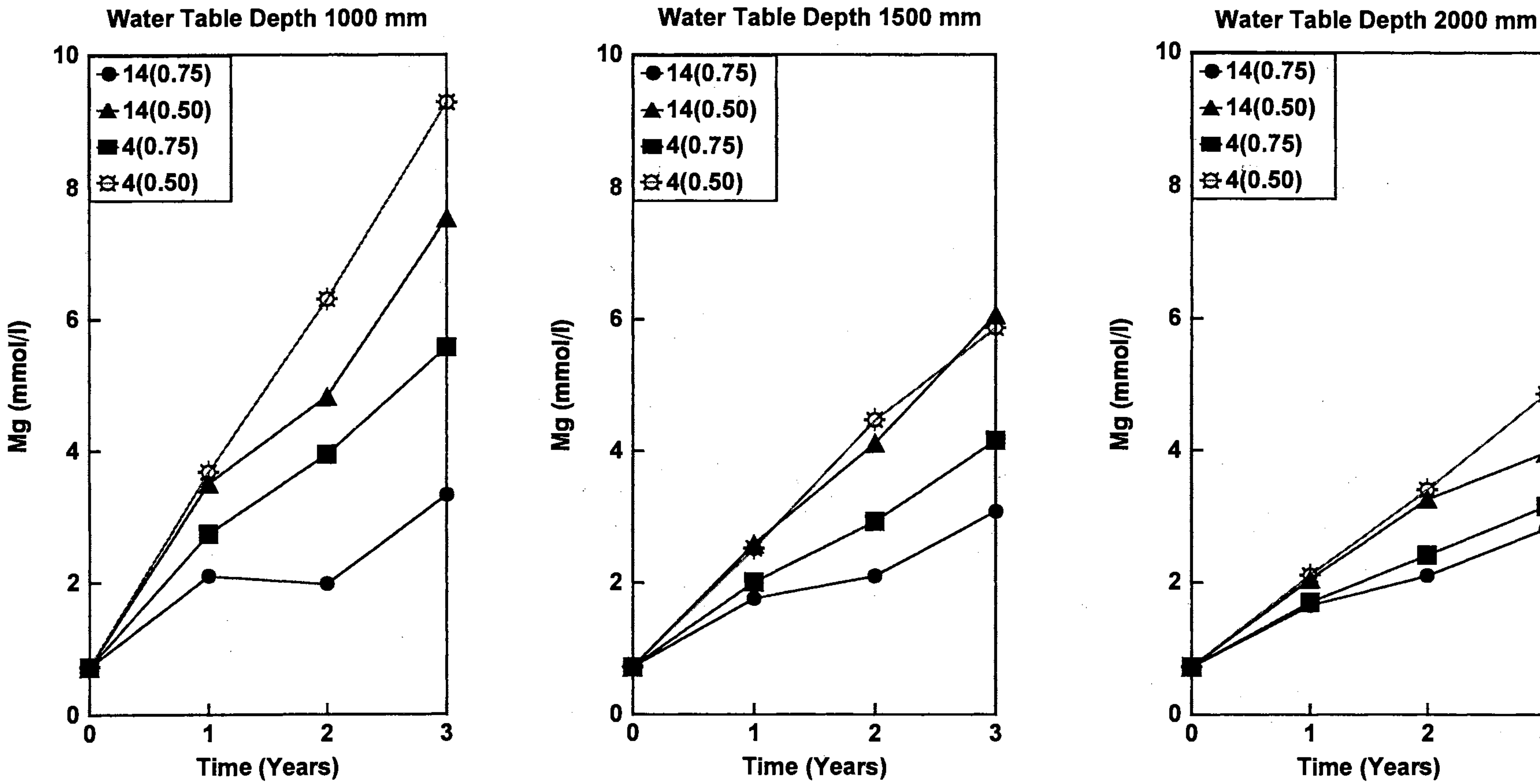


Figure 31. Predicted Average Mg of the Soil Profile for 4 Irrigation Strategies (4 and 14 days as Irrigation Intervals; 0.75 and 0.50 of ET as Irrigation Application Amounts) and 3 Water Table Depths (Sandy Loam Soil; Cotton Crop; Electrical Conductivity of Water Table 6 dS/m)

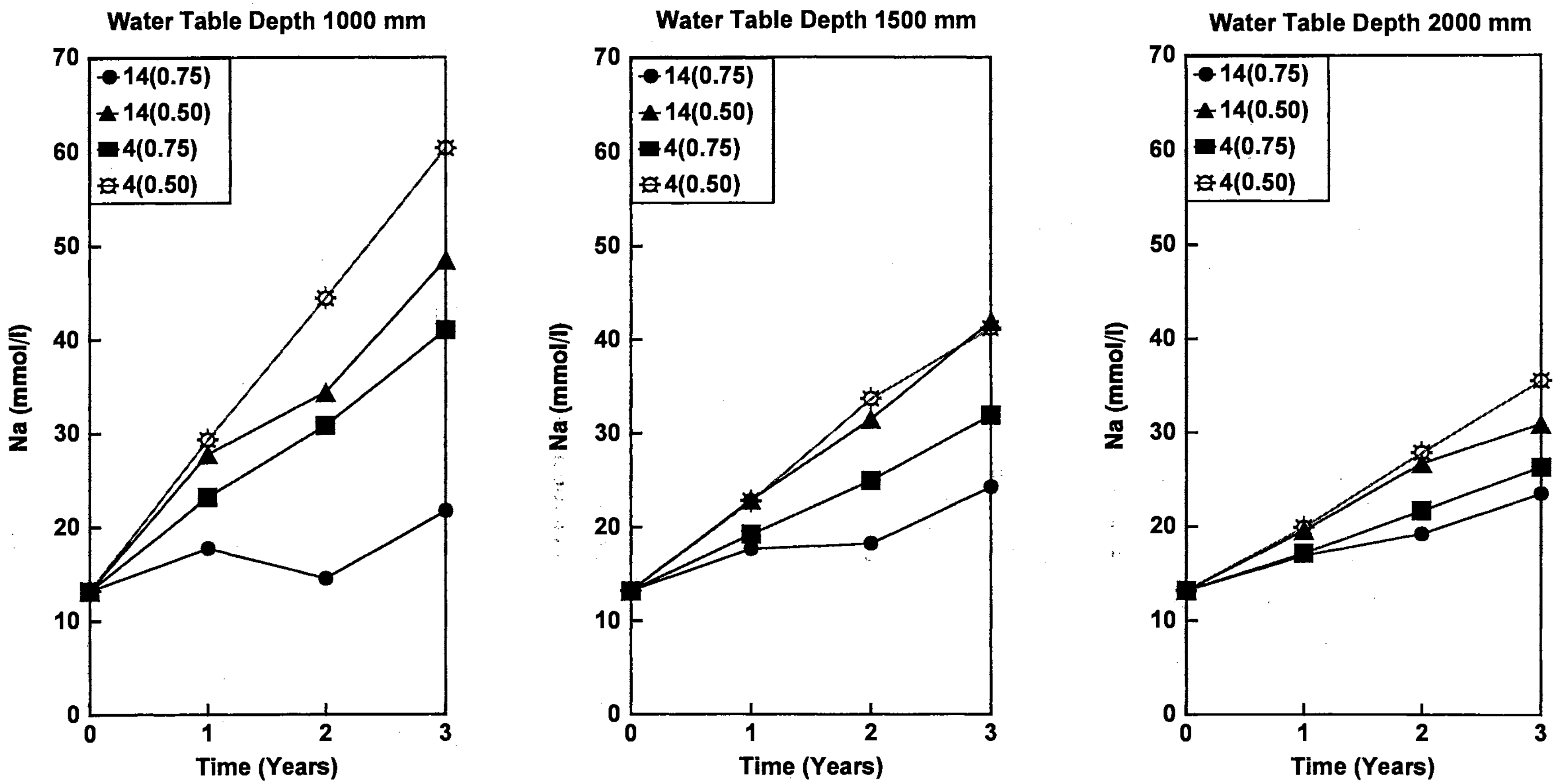


Figure 32. Predicted Average Na of the Soil Profile for 4 Irrigation Strategies (4 and 14 days as Irrigation Intervals; 0.75 and 0.50 of ET as Irrigation Application Amounts) and 3 Water Table Depths (Sandy Loam Soil; Cotton Crop; Electrical Conductivity of Water Table 6 dS/m)

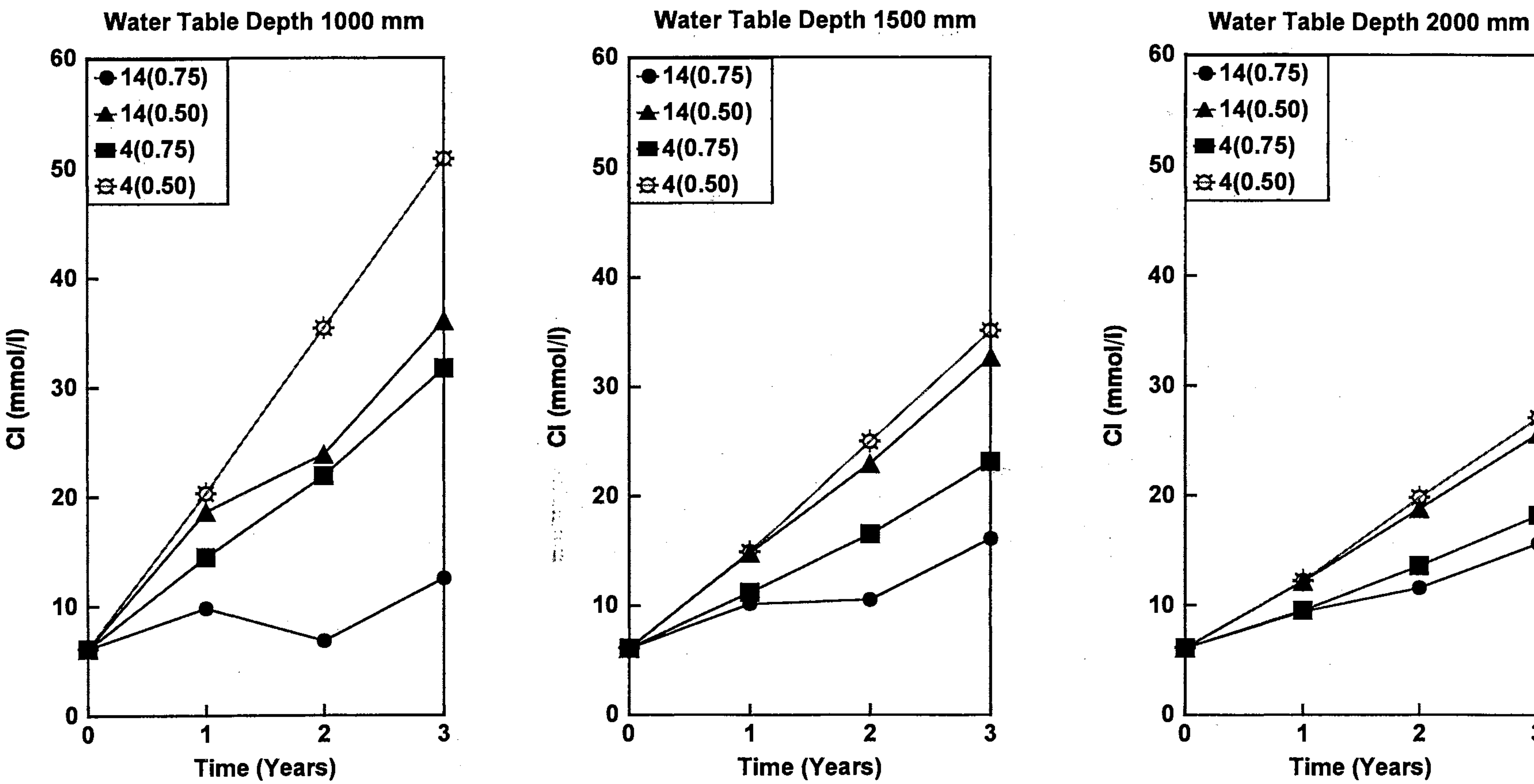


Figure 33. Predicted Average Cl of the Soil Profile for 4 Irrigation Strategies (4 and 14 days as Irrigation Intervals; 0.75 and 0.50 of ET as Irrigation Application Amounts) and 3 Water Table Depths (Sandy Loam Soil; Cotton Crop; Electrical Conductivity of Water Table 6 dS/m)

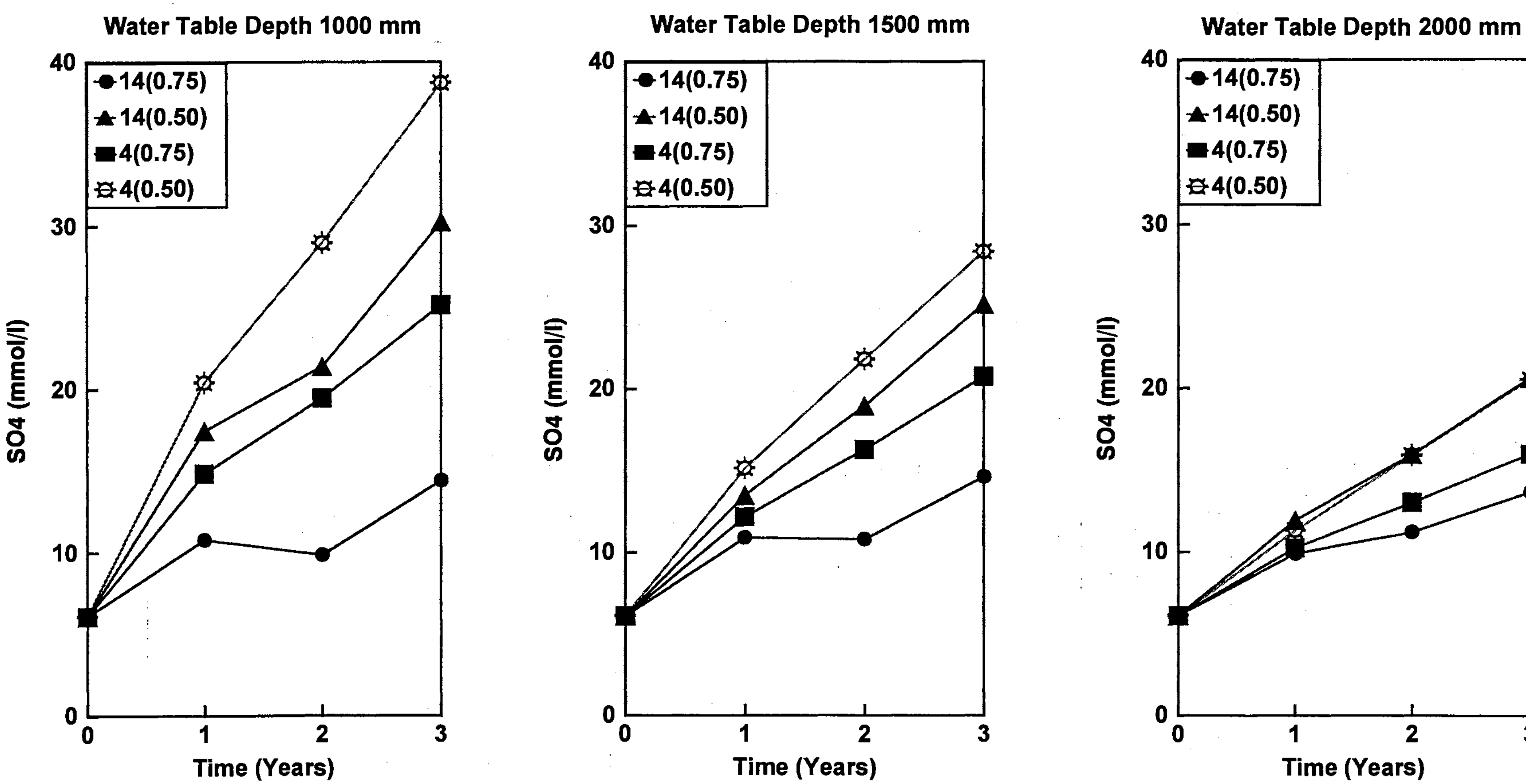


Figure 34. Predicted Average SO4 of the Soil Profile for 4 Irrigation Strategies (4 and 14 days as Irrigation Intervals; 0.75 and 0.50 of ET as Irrigation Application Amounts) and 3 Water Table Depths (Sandy Loam Soil; Cotton Crop; Electrical Conductivity of Water Table 6 dS/m)

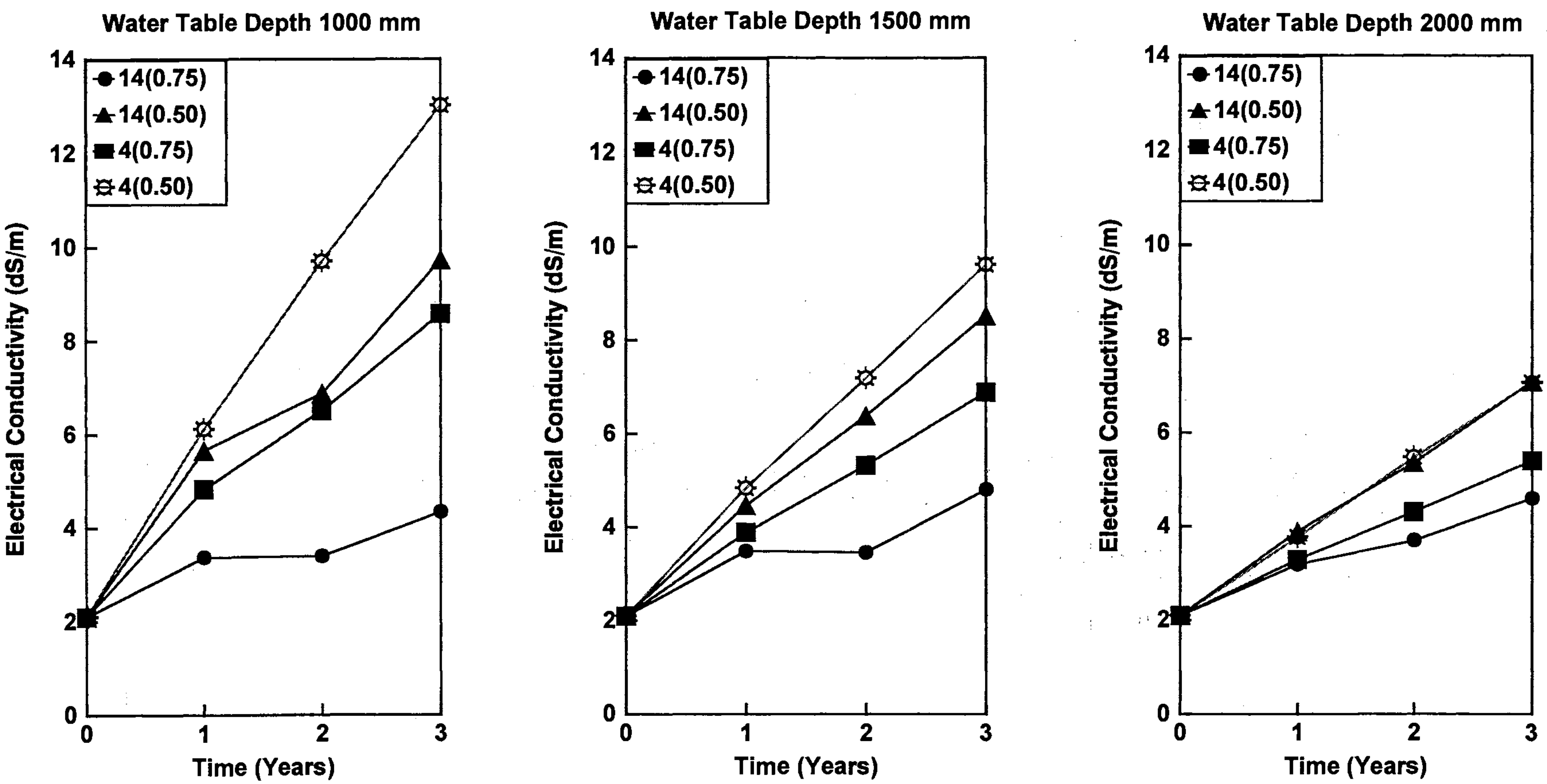


Figure 35. Predicted Average EC of the Soil Profile for 4 Irrigation Strategies (4 and 14 days as Irrigation Intervals; 0.75 and 0.50 of ET as Irrigation Application Amounts) and 3 Water Table Depths (Sandy Loam Soil; Cotton Crop; Electrical Conductivity of Water Table 6 dS/m)

between observed and predicted EC was better than for any of the individual ions when LEACHC was validated using data from the drip and furrow irrigated field plots (chapter 3). Therefore in the remainder of this chapter, only the average EC of the soil profile will be used as a salinity "yardstick". The conclusions drawn based on comparisons of EC should be valid for individual ions as well.

It is evident from Figure 35 that the favorable water table depth is 2000 mm under the given conditions (i.e., sandy loam soil; cotton crop; and EC of the water table 6 dS/m). For one of the irrigation strategies (providing 75% of ET on a 14 day interval), the average EC of the soil profile was virtually the same for all three water table depths. This strategy provides the largest application amounts for individual irrigations, and thus has the greatest potential for leaching of salts. According to the simulation results, the shallower water table depths (1000 and 1500 mm) would be much more sensitive to deviations from this irrigation strategy. For a given irrigation strategy, there was very little difference among the three water table depths in terms of water table contributions to ET (Figure 36). However, as expected, there was a clear difference between the strategies providing 75% of ET and those providing only 50% of ET. For the conditions simulated, one could conclude that the water table should be maintained at a depth of at least 2000 mm.

Using results from treatments 9-12, 41-44, and 73-76 (Table 20), a similar analysis was conducted for cotton, but

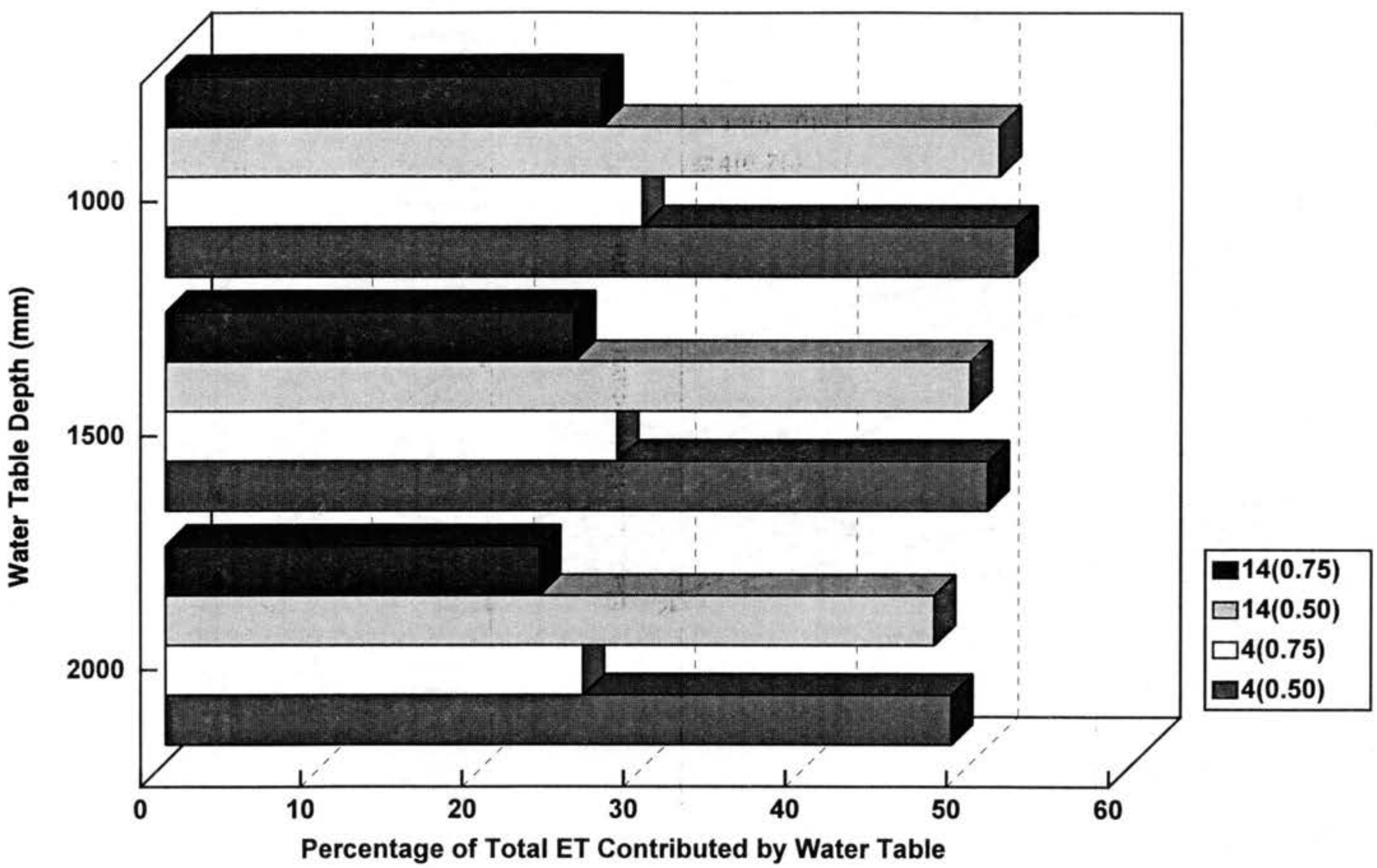


Figure 36. Predicted ET Percentage Contributed by a Water Table for 4 Irrigation Strategies (4 and 14 days as Irrigation Intervals; 0.75 and 0.50 of ET as Irrigation Application Amounts) and 3 Water Table Depths (Sandy Loam Soil; Cotton Crop; Electrical Conductivity of Water Table 6 dS/m)

on a clay loam soil and with a water table EC of 2 dS/m. Although the time trends were similar (Figure 37 versus Figure 35), the better quality water resulted in much lower EC values (approximately halved in the case of a 1000 mm water table depth). Except for the irrigation strategy with a 14 day interval and an application amount equal to 0.75 of estimated ET (14(0.75)), the average EC of the soil profile decreased as the water table was lowered from 1000 mm to 2000 mm (Figure 37). For the 14(0.75) irrigation strategy, the salts leached down to the water table for the 1000 mm and 1500 mm water table depths. As the soil profile became larger (2000 mm water table depth), some of the salts did not reach the water table although they were displaced downward. Virtually the same percentage of ET was contributed by all water table depths (Figure 38). Under these given conditions, it would be possible to tolerate a somewhat shallower water table than in the preceding analysis. However water table depths of 1500 mm and especially 1000 mm would be more confining to crop roots and would be more susceptible to temporary water logging due to large precipitation events.

To focus on the influence of a particular irrigation strategy on salt accumulation in the root zone, treatments 29-32, 61-64, and 93-96 (Table 20) were compared. These treatments pertain to a water table EC of 6 dS/m, a clay loam soil and a wheat crop. Average EC's of the soil profile were compared for three water table depths and four irrigation strategies (Figure 39). The 14(0.75) irrigation strategy (14

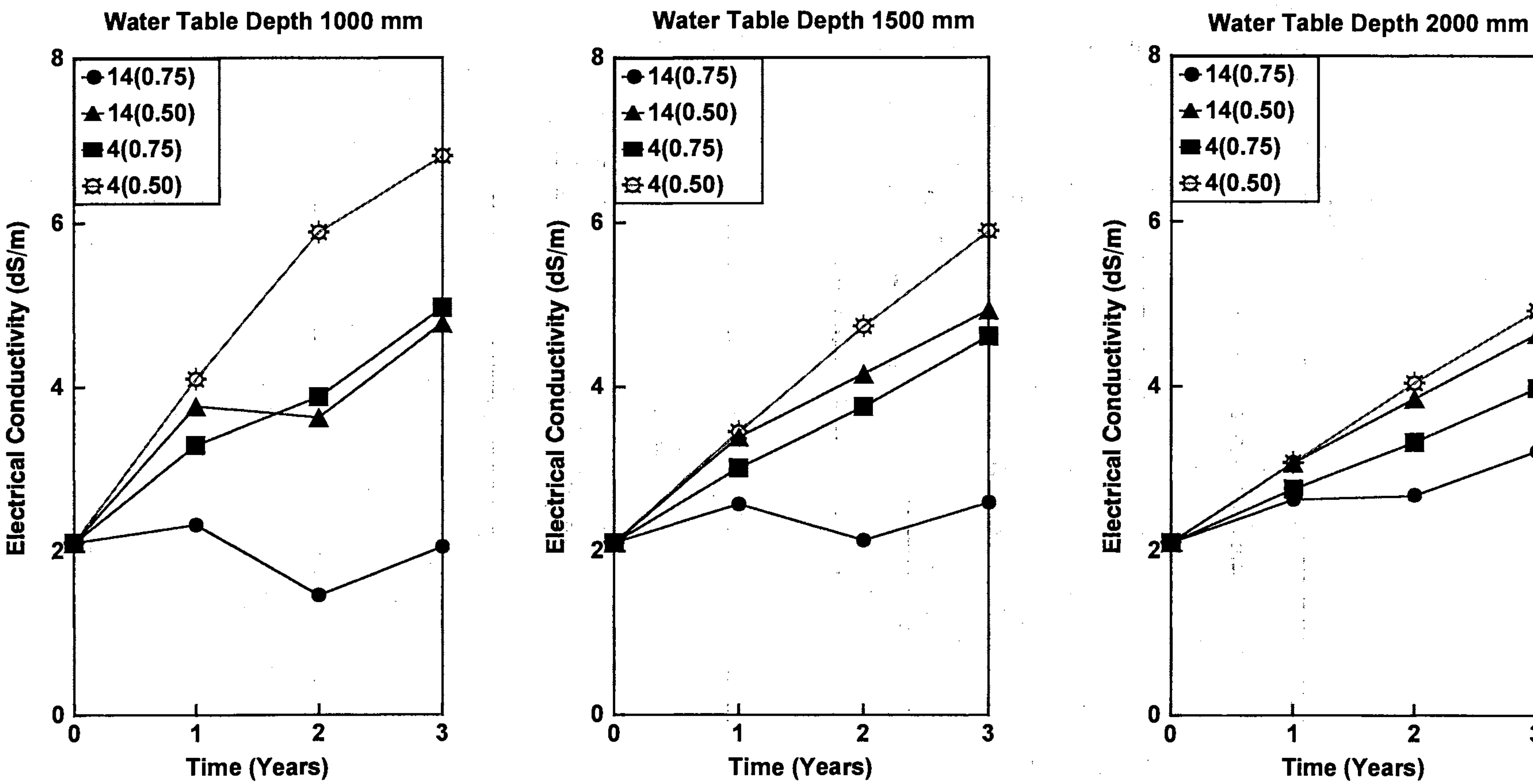


Figure 37. Predicted Average EC of the Soil Profile for 4 Irrigation Strategies (4 and 14 days as Irrigation Intervals; 0.75 and 0.50 of ET as Irrigation Application Amounts) and 3 Water Table Depths (Clay Loam Soil; Cotton Crop; Electrical Conductivity of Water Table 2 dS/m)

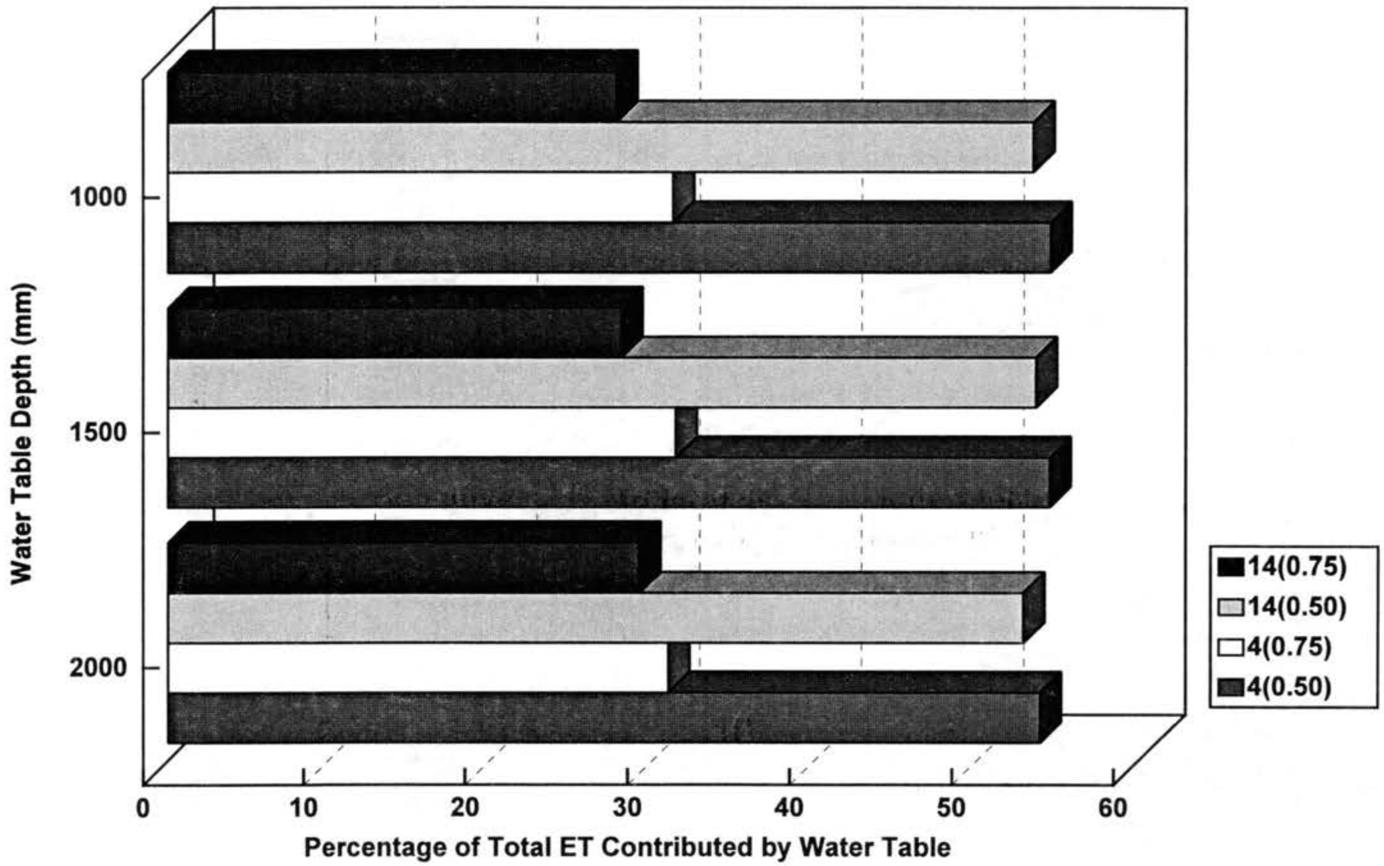


Figure 38. Predicted ET Percentage Contributed by a Water Table for 4 Irrigation Strategies (4 and 14 days as Irrigation Intervals; 0.75 and 0.50 of ET as Irrigation Application Amounts) and 3 Water Table Depths (Clay Loam Soil; Cotton Crop; Electrical Conductivity of Water Table 2 dS/m)

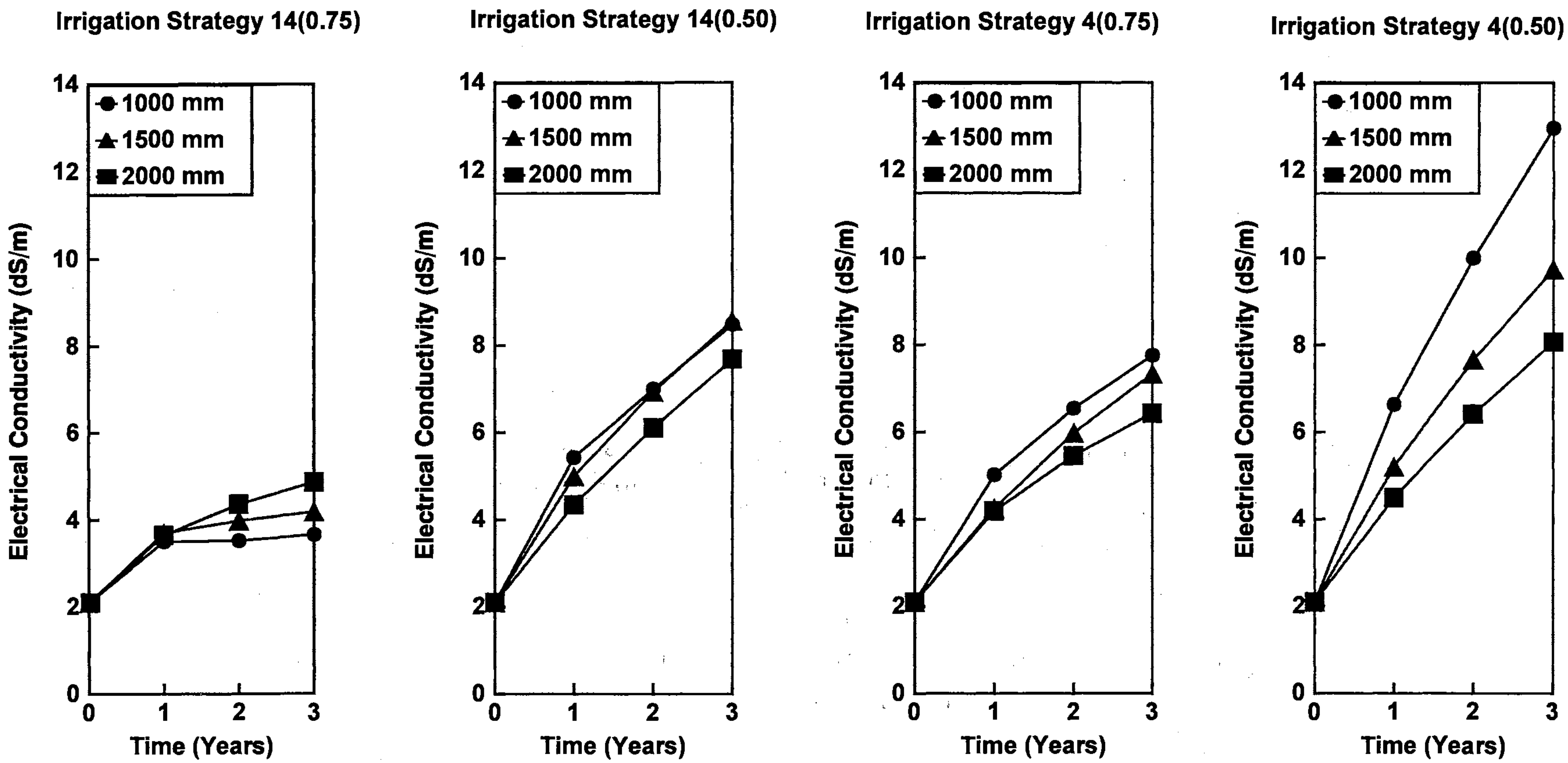


Figure 39. Predicted Average EC of the Soil Profile for 4 Irrigation Strategies (4 and 14 days as Irrigation Intervals; 0.75 and 0.50 of ET as Irrigation Application Amounts) and 3 Water Table Depths (Clay Loam Soil; Wheat Crop; Electrical Conductivity of Water Table 6 dS/m)

days as irrigation interval with irrigation application amount equal to 0.75 of estimated ET during the interval) resulted in the lowest average EC's. The irrigation strategies of 14(0.50) and 4(0.75) had very similar responses, with somewhat higher EC's than the 14(0.75) strategy. The highest EC's were found with the 4(0.50) irrigation strategy. As opposed to the other irrigation strategies, with 14(0.75) the average EC's for the 1000 and 1500 mm water table depths were smaller than those for the 2000 mm depth. This indicates that some of the leached salts were left remaining in the deeper soil profile.

As shown previously, the 14(0.75) strategy also proved to be superior for a cotton crop on a sandy loam soil with a water table EC of 6 dS/m (Figures 30 to 35), and a clay loam soil with a water table EC of 2 dS/m (Figure 37).

Treatments 29-32, 61-64, and 93-96 were also used to examine the effect of irrigation strategy and water table depth on crop yield. Empirical expressions exist to describe the relationship between relative yield and soil salinity (Mass and Hoffman, 1977; U.S. Salinity Laboratory Staff, 1954). The relative yields were estimated by using the Maas and Hoffman (1977) relationship (Figure 40). Since this approach is based on the average EC of the soil profile over the growing season, the simulated soil EC profiles at the beginning, middle and end of the growing season were averaged. During the first year, there was no reduction in yield for any irrigation strategy at any water table depth (Figure 41). The initial EC of the soil profile was assumed to be low, and none

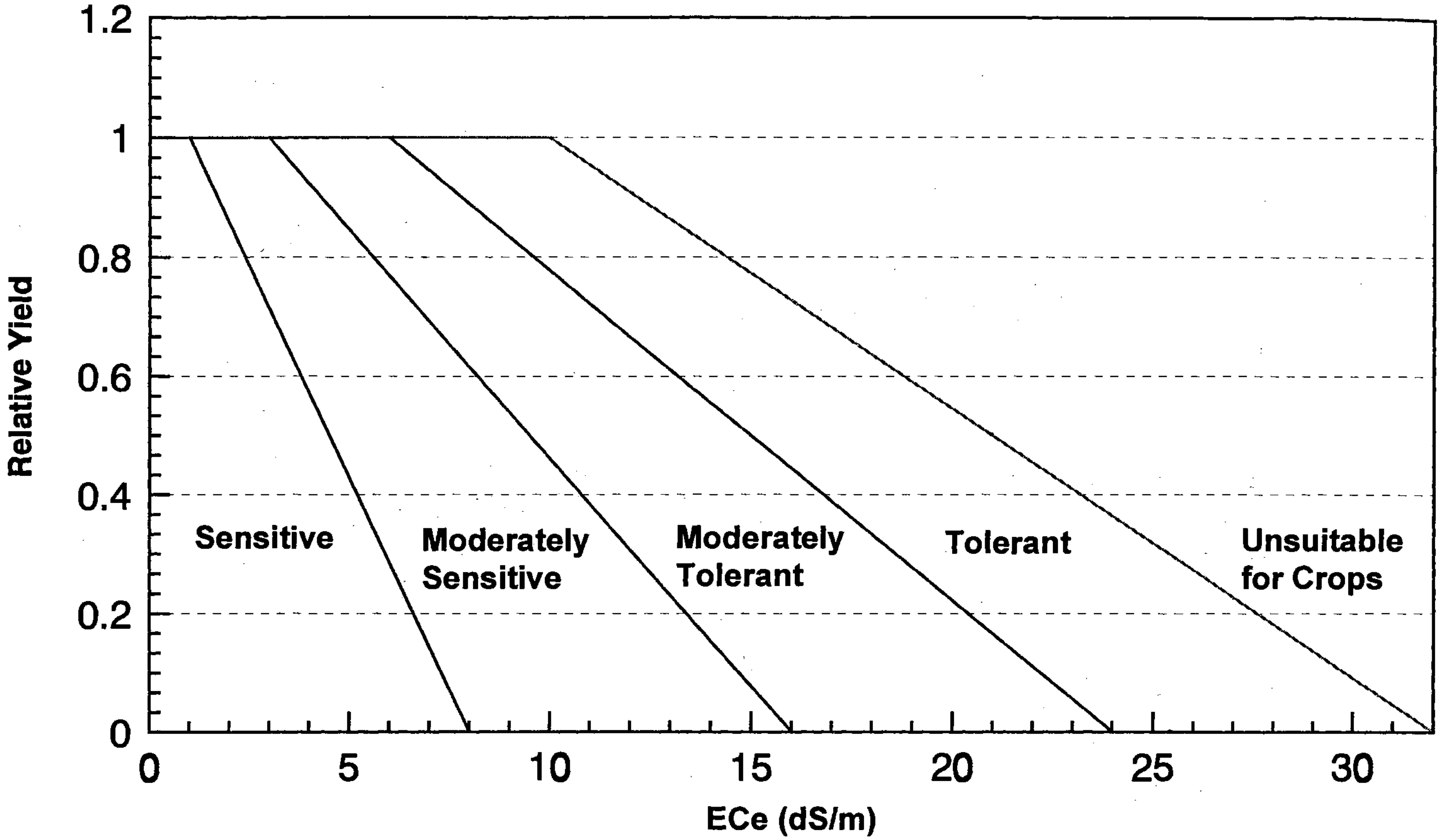


Figure 40. Empirical Relationships Between Relative Yield and Soil Salinity for Sensitive to Tolerant Crops (After Mass and Hoffman, 1977)

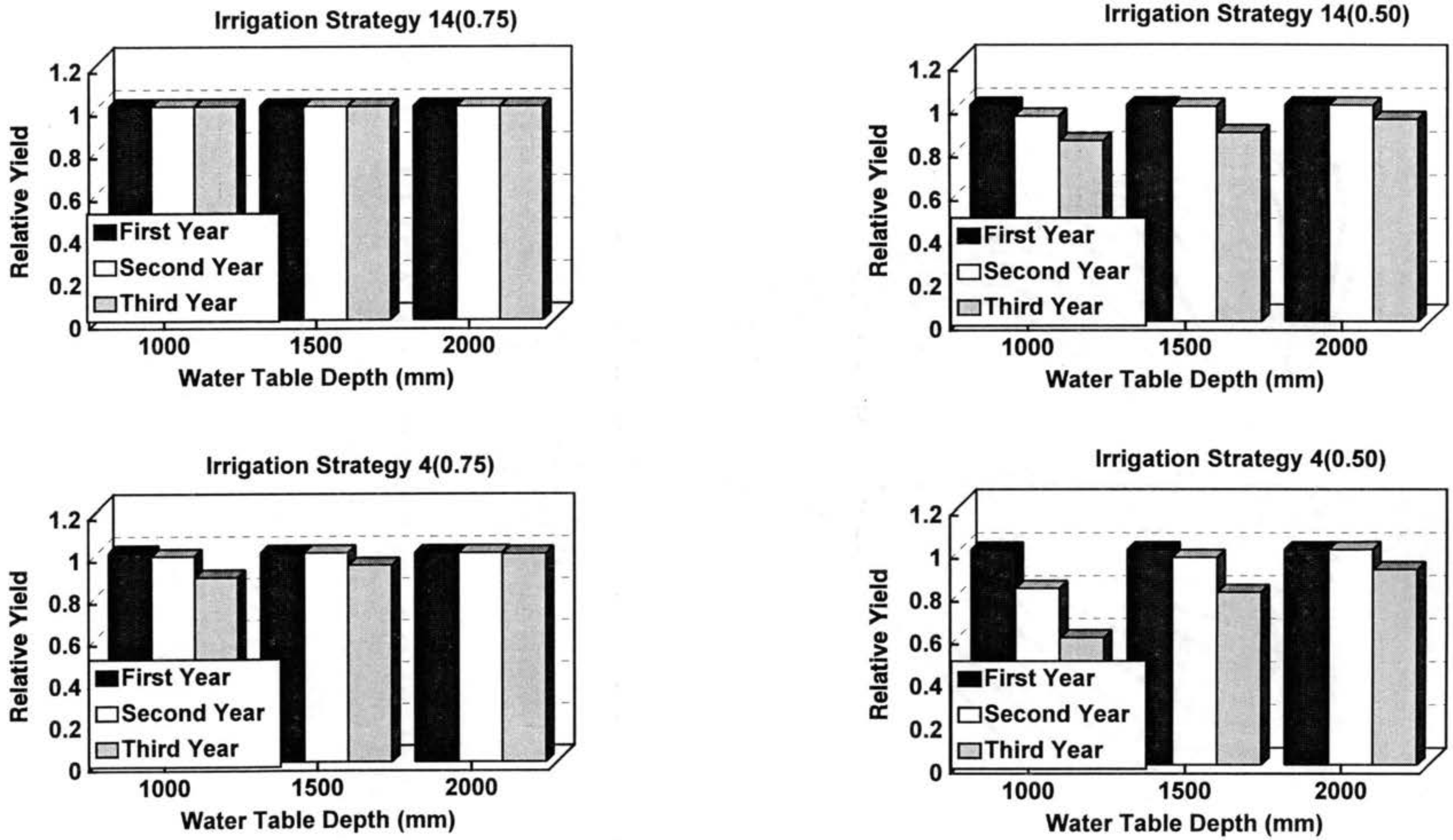


Figure 41. Relative Yield of Wheat Crop for 4 Irrigation Strategies (4 and 14 days as Irrigation Intervals; 0.75 and 0.50 of ET as Irrigation Application Amounts) and 3 Water table Depths (Clay Loam Soil; Electrical Conductivity of Water Table 6 dS/m)

of the selected irrigation strategies raised the average EC enough to reach the threshold level for wheat (6 dS/m). For the 14(0.75) irrigation strategy, there was no yield reduction at any water table depth for any of the years. The only reduction for the 4(0.75) strategy occurred during the third year for the 1000 and 1500 mm water table depths. For the 14(0.50) strategy, there were third-year reductions for all three water table depths, and second-year reductions for the 1000 and 1500 mm depths.

Simulation results for the 4(0.50) strategy suggested nearly a 40% reduction in the yield of the third year's wheat crop if the water table was maintained at 1000 mm. The yield reduction for the second year's crop was also significant. A sizable reduction also resulted for the third year with a 1500 mm water table depth.

Under the given conditions, there would be no wheat yield reduction if the 14(0.75) irrigation strategy were to be adopted, for any water table depth between 1000 and 2000 mm. Whereas if the "worst" irrigation strategy (4(0.50)) were to be adopted, there would be reductions from the third year onward for every water table depth. However the reduction would be relatively small if the water table was maintained at 2000 mm.

To better isolate the impact of water table salinity level on salt accumulation in the root zone, treatments 13-16 (water table EC 2 dS/m) were compared with treatments 29-32 (water table EC 6 dS/m). These treatments all reflect a wheat crop on a clay loam soil with a 1000 mm water table depth. Similarly for the other two water table depths, treatments 45-48 and 61-64 were compared, as well as treatments 77-80 and 93-96.

The effect of water table EC on the accumulation of salts in the soil profile is very obvious (Figures 42 to 44). As expected, at all water table depths, the average EC's of the soil profile were smaller when the water table EC was 2 dS/m than when the water table EC was 6 dS/m. When the water table EC was 6 dS/m and the water table depths were shallow, the particular irrigation strategy had a relatively large effect on the average soil EC. Irrigation strategy had less impact for better quality water (2 dS/m) and deeper water tables (2000 mm). Except for the 14(0.75) irrigation strategy, the average EC of the soil profile tended to decrease as the water table was lowered to the 1500 and 2000 mm depths. Considerable leaching was provided by the 14(0.75) strategy, particularly for the 1000 mm depth. The influence of water table depth on soil EC was greater for the 6 dS/m water than for the 2 dS/m water.

To check the impact of soil type on salt accumulation, only treatments 49-52 and 57-60 were compared with each other. These treatments correspond to a 1500 mm water table depth, a cotton crop, and a water table EC of 6 dS/m. For other water table depths, similar responses were obtained and therefore for brevity only the results for the 1500 mm water table depth are presented graphically (Figure 45).

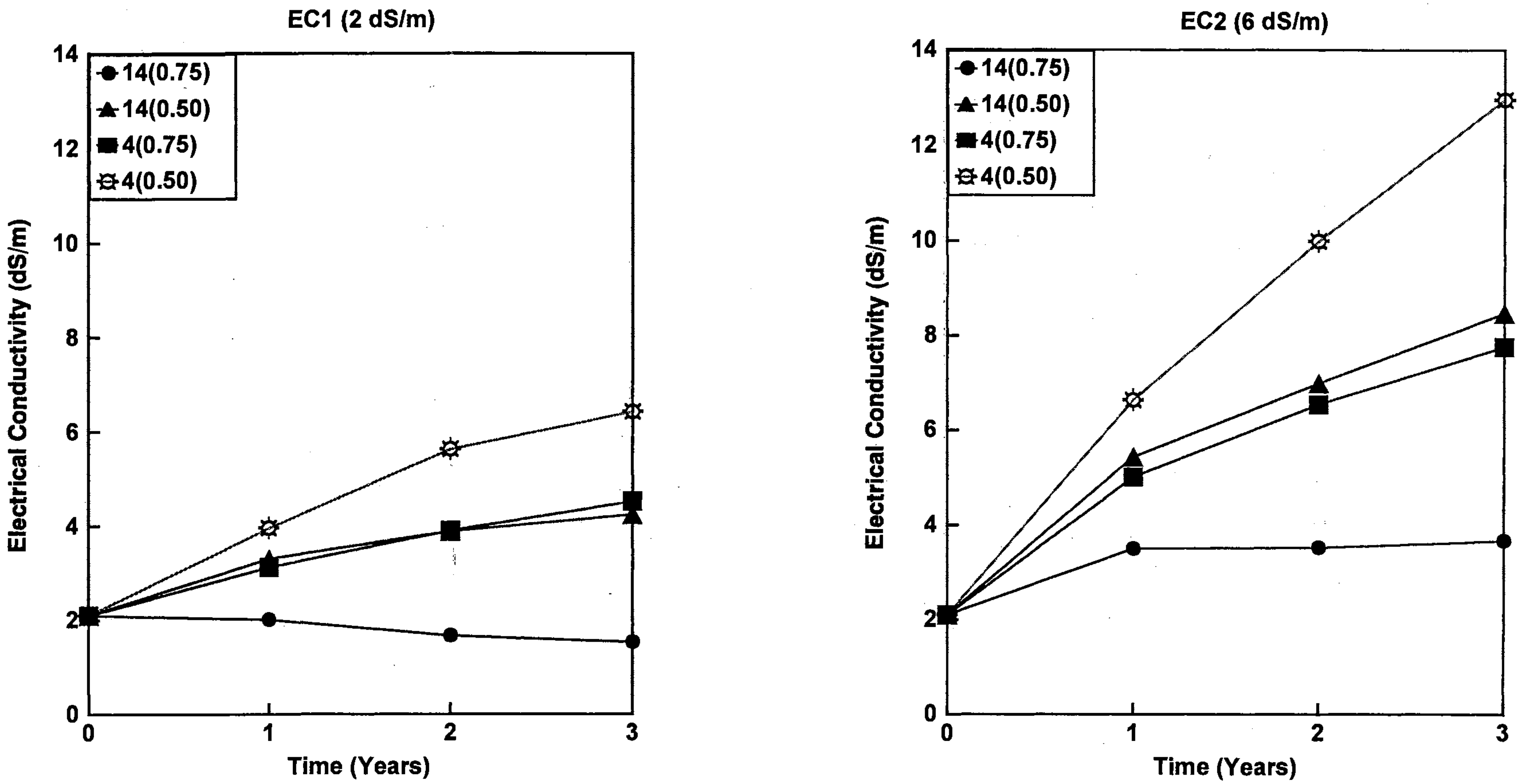


Figure 42. Predicted Average EC of the Soil Profile for 2 Water Table Electrical Conductivities and 4 Irrigation Strategies (4 and 14 Days as Irrigation Intervals; 0.75 and 0.50 of ET as Irrigation Application Amounts) at 1000 mm Water Table Depth (Clay Loam Soil; Wheat Crop)

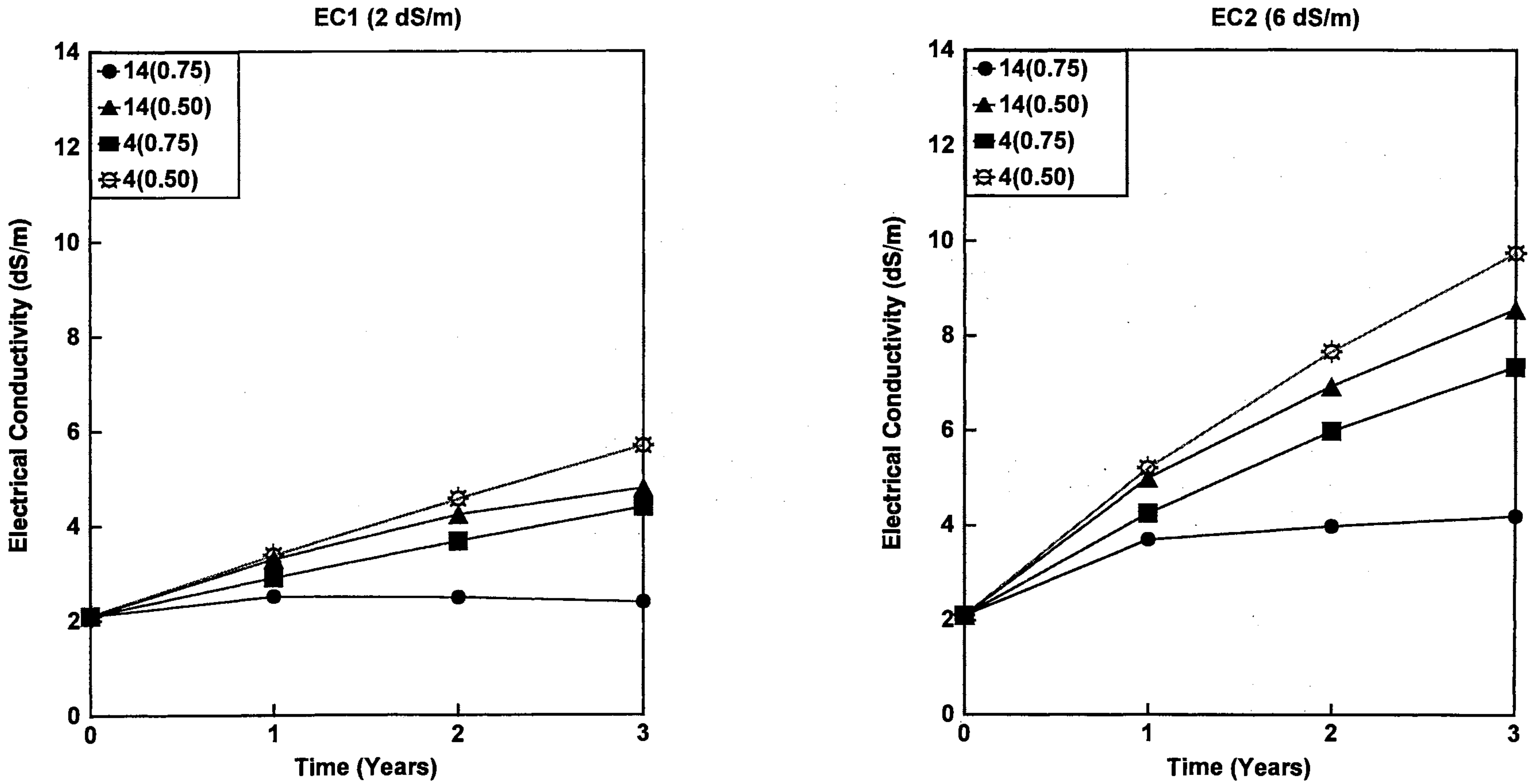


Figure 43. Predicted Average EC of the Soil Profile for 2 Water Table Electrical Conductivities and 4 Irrigation Strategies (4 and 14 Days as Irrigation Intervals; 0.75 and 0.50 of ET as Irrigation Application Amounts) at 1500 mm Water Table Depth (Clay Loam Soil; Wheat Crop)

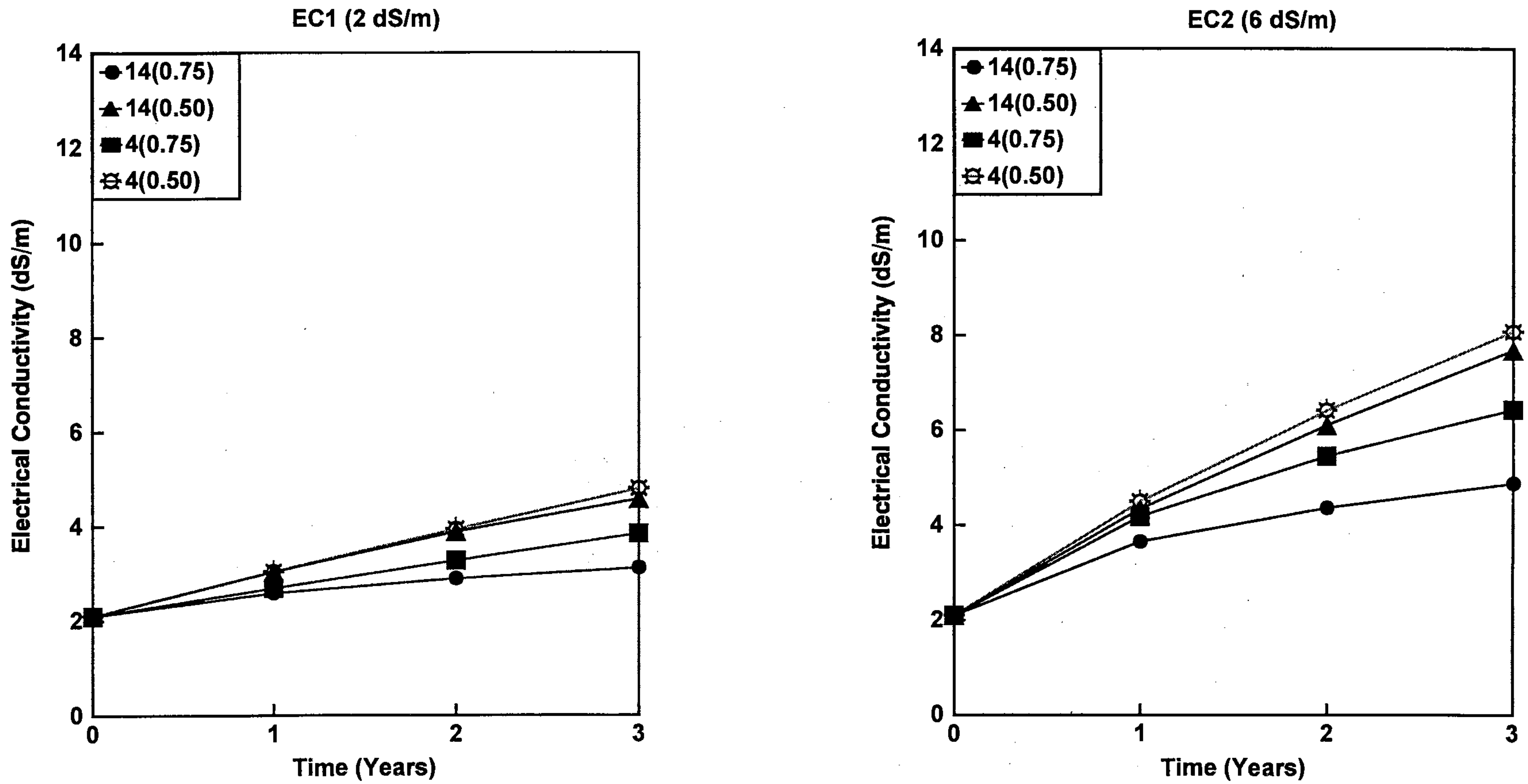


Figure 44. Predicted Average EC of the Soil Profile for 2 Water Table Electrical Conductivities and 4 Irrigation Strategies (4 and 14 Days as Irrigation Intervals; 0.75 and 0.50 of ET as Irrigation Application Amounts) at 2000 mm Water Table Depth (Clay Loam Soil; Wheat Crop)

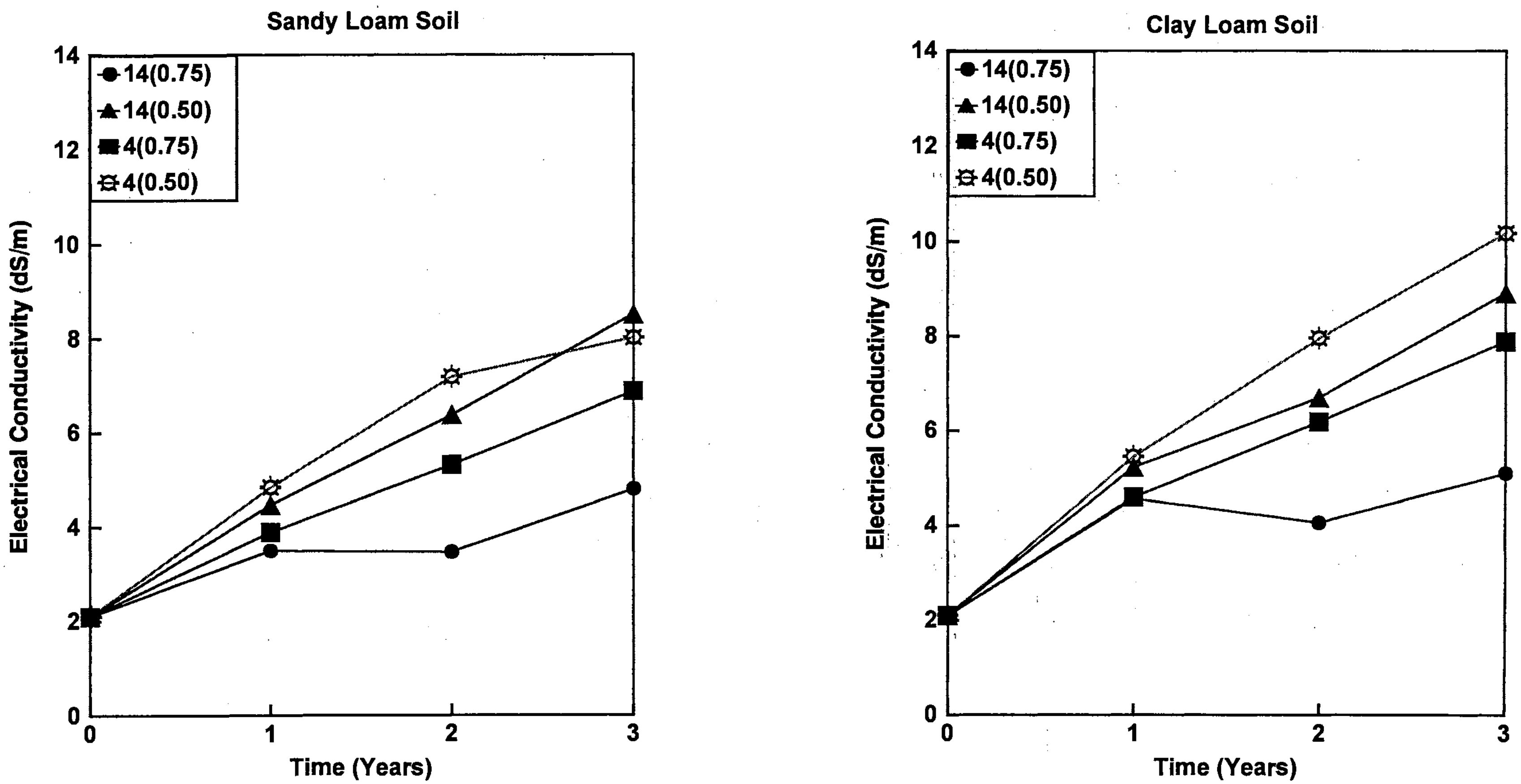


Figure 45. Predicted Average EC of the Soil Profile for 2 Soil Types and 4 Irrigation Strategies (4 and 14 Days as Irrigation Intervals; 0.75 and 0.50 of ET as Irrigation Application Amounts) at 1500 mm Water Table Depth (Cotton Crop; EC of water Table 6 dS/m)

Average EC's of the soil profile obtained for the sandy loam soil tended to be a little lower than those obtained for the clay loam soil (Figure 45). Under these conditions, the clay loam soil was able to transport and accumulate more salts in the soil profile as should be expected.

Similar responses were obtained for both the crops at a particular water table depth and for a particular water table EC, irrigation strategy and soil type. In Figure 46, treatments 81-84 and 85-88 are compared to illustrate the minimal differences between the two crops. Since total estimated ET differed by only a small amount for the two crops, similar average EC's in the soil profile should be expected. Therefore under the given conditions, similar levels of salt accumulation in the soil profile would be expected whether a cotton or wheat crop is grown.

To check the influence of simulation period on the accumulation of salts in the soil profile, the simulations for treatments 25-28, 57-60, and 89-92 were increased from three years to six years. These treatments reflect a water table EC of 6 dS/m, a clay loam soil, and a cotton crop. The crop and ET data used for the first three years were repeated for the next three years.

The average EC's of the soil profile as a result of using various irrigation strategies tended to increase throughout the simulation period at all water table depths (Figures 47 to 49). Maximum and minimum average EC's of the soil profile were obtained at 1000 and 2000 mm water table depths, respectively,

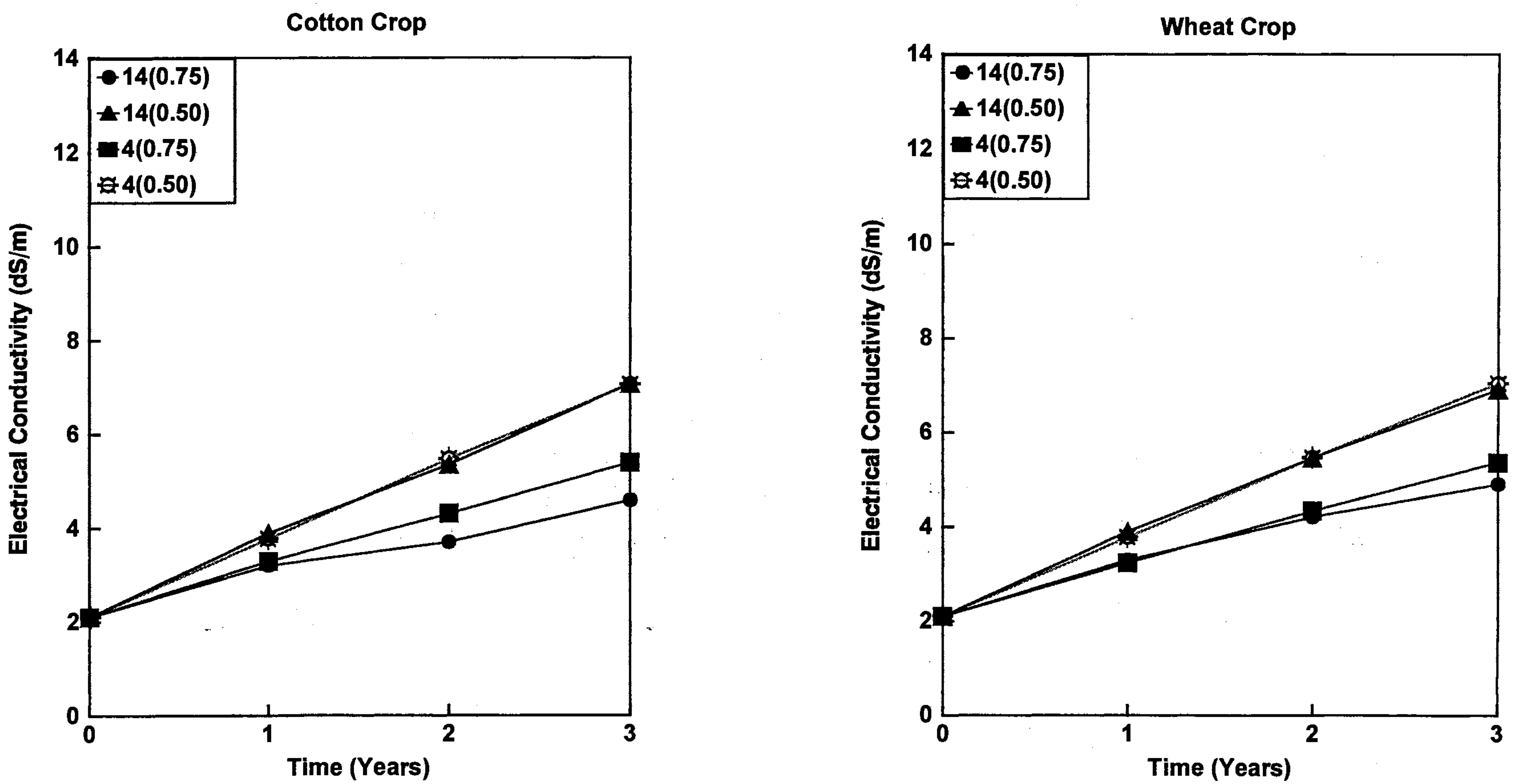


Figure 46. Predicted Average EC of the Soil Profile for 2 Crop Types and 4 Irrigation Strategies (4 and 14 Days as Irrigation Intervals; 0.75 and 0.50 of ET as Irrigation Application Amounts) at 2000 mm Water Table Depth (Sandy Loam Soil; EC of water Table 6 dS/m)

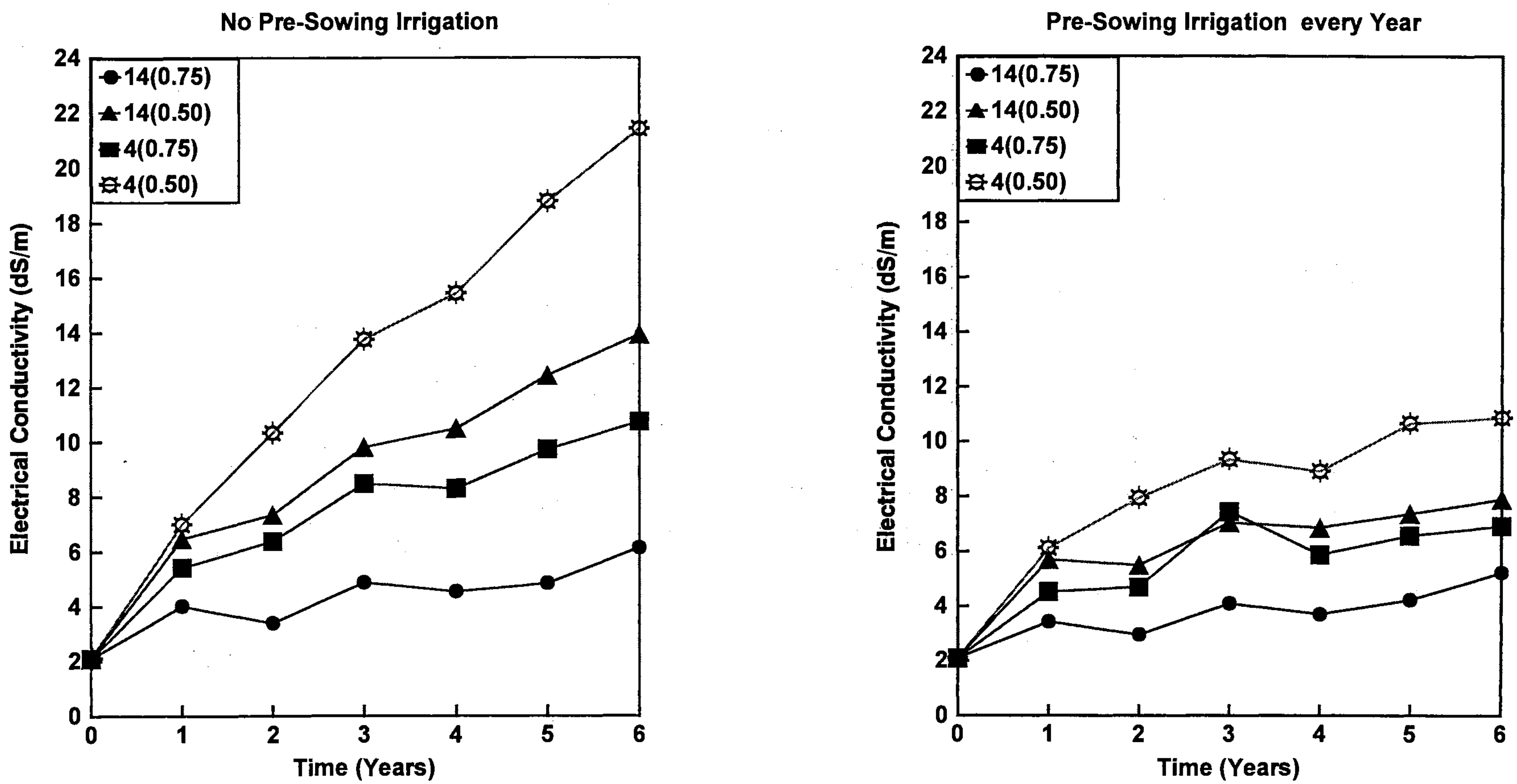


Figure 47. Predicted Average EC of the Soil Profile without and with Pre-Sowing Irrigation for 4 Irrigation Strategies (4 and 14 Days as Irrigation intervals; 0.75 and 0.50 of ET as Irrigation Application Amounts) at 1000 mm Water Table Depth (Clay Loam Soil; Cotton Crop; Electrical Conductivity of Water Table 6 dS/m)

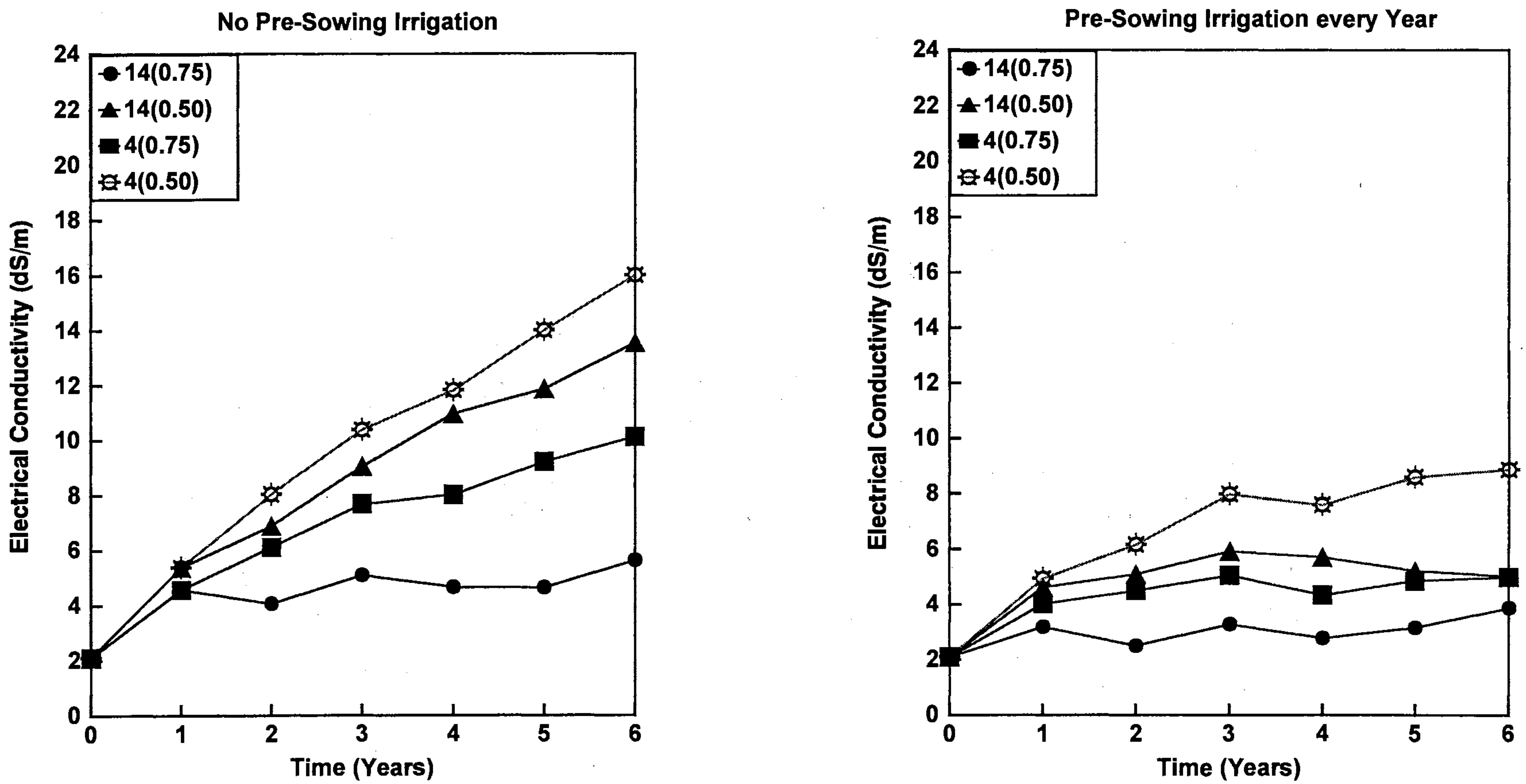


Figure 48. Predicted Average EC of the Soil Profile without and with Pre-Sowing Irrigation for 4 Irrigation Strategies (4 and 14 Days as Irrigation intervals; 0.75 and 0.50 of ET as Irrigation Application Amounts) at 1500 mm Water Table Depth (Clay Loam Soil; Cotton Crop; Electrical Conductivity of Water Table 6 dS/m)

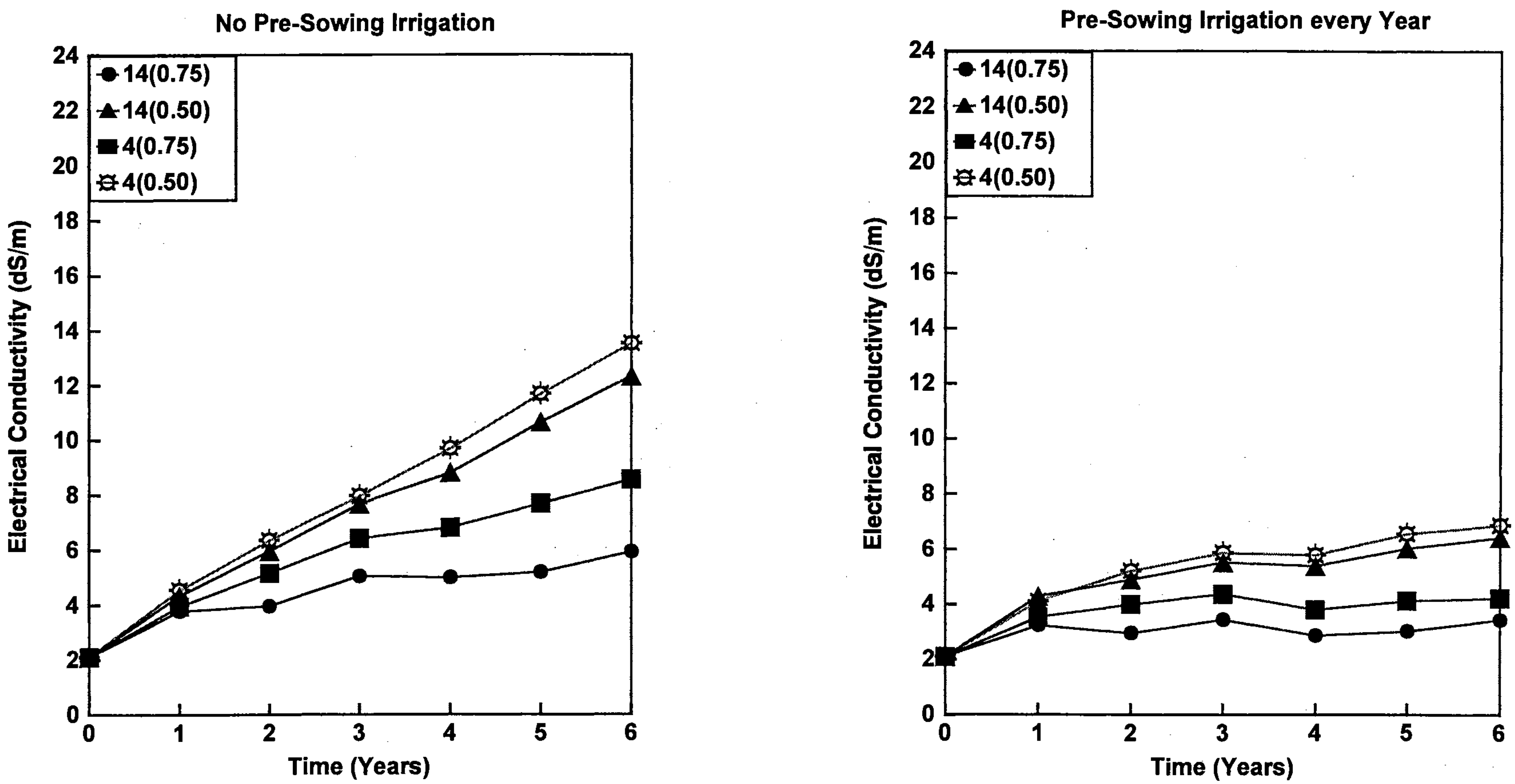


Figure 49. Predicted Average EC of the Soil Profile without and with Pre-Sowing Irrigation for 4 Irrigation Strategies (4 and 14 Days as Irrigation intervals; 0.75 and 0.50 of ET as Irrigation Application Amounts) at 2000 mm Water Table Depth (Clay Loam Soil; Cotton Crop; Electrical Conductivity of Water Table 6 dS/m)

as was the case when the simulation period was three years. The best irrigation strategy (in terms of salinity) was 14(0.75) and the worst was 4(0.50). The influence of irrigation strategy on the accumulation of salts was more pronounced at shallow water table depths. When the irrigation strategy was 14(0.75), the effect of water table depth was small. Water table depth became especially important for the 4(0.50) irrigation strategy. In short the conclusions drawn based on a simulation period of three years remained unchanged when the simulation period was increased to six years.

The above treatments (25-28, 57-60, and 89-92) were also used to check the influence of pre-sowing irrigation on salinity build up in the root zone. A pre-sowing irrigation of 125 mm was applied each year for the entire simulation period of six years. At each water table depth, average EC's of the soil profile were obtained both with and without a pre-sowing irrigation (Figures 47 to 49).

Except for the 14(0.75) strategy, the use of a pre-sowing irrigation resulted in a 50% reduction in salinity build up at the end of the six year simulation period for a water table depth of 1000 mm (Figure 47). Since leaching was already present for the 14(0.75) strategy, pre-sowing irrigation did not have much of an effect. An unexpected value was obtained at the end of the third year for 4(0.75).

Similar salinity reduction patterns were observed for the case of pre-sowing irrigation with a water table depth of 1500 mm (Figure 48). The influence of pre-sowing irrigations was also very clear for the 2000 mm water table depth (Figure 49). When pre-sowing irrigation was used, the difference between the two extreme irrigation strategies (14(0.5) and 4(0.50)) was relatively small. The trends shown for the 1500 and 2000 mm water table depths suggested that pre-sowing irrigations would cause the EC in the root zone to reach a near-equilibrium condition.

CHAPTER V

SUMMARY, CONCLUSIONS, AND RECOMMENDATIONS

SUMMARY

The problem of soil salinity is very common in today's agriculture. High salinity levels adversely impact crop yields and reduce overall soil quality. The presence of a saline shallow water table can be a major contributor to this problem. Salt accumulation in the root zone is influenced by not only water table depth, but also the quality of the ground water, the soil type, the crop being grown, and the irrigation management strategy.

These effects, and their interrelationships, can be analyzed by using an appropriate soil salinity model. Several models have been developed for the simulation of water and solute transport in the root zone under unsaturated conditions. Most of these models describe solute transport in terms of total salinity with relatively simple treatment of source-sink terms. Only a few numerical models exist which consider movement of individual ions and the detailed treatment of chemical equilibrium processes. One such model, LEACHC (Hutson and Wagenet, 1992), also provides the flexibility of choosing various boundary conditions. LEACHC has apparently not previously been tested under saline shallow water table conditions. To perform this testing, two types of data (lysimeter and field) were utilized.

Lysimeter data were obtained from Ram et al. (1981), who conducted greenhouse experiments in India. Twelve of their treatments were used in this study. These encompass three water table depths (500, 1000, and 1500 mm), two crops (wheat and maize), and two surface conditions (no mulch and 50 mm rice husk mulch). The water table salinity level was 4 dS/m. The crops used ground water to meet all of their water requirements. The concentrations of various ions were observed at two soil depths after crop harvest. These observed concentrations were compared to those predicted by the LEACHC model.

The field data were obtained from the Water Management Research Laboratory, USDA-ARS, Fresno, California. These data include two plots (drip and furrow) where cotton, wheat, and sugarbeet crops were rotated during a five-year period in the case of the drip irrigated plot, and a four-year period in the case of the furrow irrigated plot. A water table was present at a depth of approximately 1750 mm, with a salinity level of about 8.75 dS/m under the drip irrigated plot and 6.75 dS/m under the furrow irrigated plot. Good quality water was used to irrigate the furrow plot while the water used for irrigation of the drip irrigated plot was poor quality drainage water from adjacent fields. The observed concentrations of individual ions and the measured EC of the soil profile were available at eight times for the drip plot and four times for the furrow plot. The observed and predicted water contents of the soil profile were compared at six different times for each plot.

After its validation, LEACHC was used to simulate the effects of various water table depths, water table salinity levels, irrigation management strategies, soil types, and crop types on the accumulation and distribution of salts in the root zone and on relative crop yield. There were three water table depths (1000, 1500, and 2000 mm), two water table salinity levels (2 and 6 dS/m), four irrigation strategies (14 and 4 days as irrigation interval with either 0.75 or 0.50 of ET as irrigation application amounts), two soil types (sandy loam and clay loam), and two crops (cotton and wheat). There were 96 treatments in all. ET and other crop information were extracted from the California field data used in model testing. The simulation period was selected as three years. To check salinity trends in the root zone over longer periods of time, the simulation period for twelve of the treatments was increased to six years. These twelve treatments were also used for studying the effect of an annual pre-sowing irrigation on the accumulation of salts in the root zone.

CONCLUSIONS

LEACHC performed reasonably well in simulating solute transport above a shallow saline water table. For the lysimeter data, Ca and Mg were generally underpredicted by the model. In most cases, the concentrations of Na and Cl were predicted well. The SO_4 predictions were somewhat inconsistent, fairly good in some cases and poor in others. The predicted total ET was quite close to the measured, except for the two unmulched treatments with a 1500 mm water table depth.

For the field data, the LEACHC model again underpredicted Ca. The model was not able to predict either Ca or Mg with a high level of accuracy but these were not the dominant ions with respect to their contribution towards soil salinity. Measured and predicted Na and Cl profiles generally agreed quite well. The model predictions for SO_4 (and the other ions) tended to be better for the drip irrigated plot than for the furrow irrigated plot. In both plots, the model predicted EC profiles better than most of the individual ions. The model did fairly well in predicting water content profiles associated with the field data.

When LEACHC model was applied as a simulation tool, it was found that if the water table salinity level is between 2 and 6 dS/m and a cotton crop is grown over a sandy loam or a clay loam soil, then the water table should be maintained at a depth of at least 2000 mm. For both water table salinity levels (2 and 6 dS/m), there were very few differences among the three water table depths in terms of water table contributions to ET. Among four irrigation strategies selected for the analysis, the 14 day irrigation interval with replenishment of 75% of ET proved to be best for the conditions simulated. The worst of the four irrigation strategies was a 4 day interval with 50% ET replenishment, where the yield reduction was nearly 40% in the third year's wheat crop. A particular irrigation strategy had less impact for better quality water (2 dS/m) and deeper water tables (2000 mm).

The EC of the water table had a relatively large influence on salt accumulation in the root zone for shallow water table depths. The influence of water table depth on soil EC was greater for the 6 dS/m water than for the 2 dS/m water. The accumulation of salts in the root zone was slightly greater when cotton was grown in a clay loam soil than in a sandy loam soil. Both the cotton and wheat crops were similar in terms of build up of root zone salinity.

When the simulation period was increased to six years, the average EC of the soil profile continued to increase in a similar fashion. The conclusions drawn based on a simulation period of three years remained unchanged. For a water table depth of 1000 mm, an annual pre-sowing irrigation of 125 mm caused almost a 50% reduction in soil salinity at the end of the six-year simulation period, except for the irrigation strategy of 14(0.75) where the relative effect of pre-sowing irrigation was small.

Recommendations

The research in this dissertation covers: (1) the testing of LEACHC under saline shallow water table conditions, and (2) its application to investigate the effects of various water table depths and their salinity levels, irrigation management strategies, crop types and soil types on the accumulation of salts in the root zone and on relative crop yield. The recommendations for future research may include:

1. Application of LEACHC for investigating the effects of other soil types, crop types, management strategies, water table depths and water qualities on root zone salinity levels.
2. Sensitivity analysis of various model parameters such as hydraulic conductivity, soil retention characteristics, and parameters associated with chemical processes.
3. Validation and application of LEACHC under the boundary condition of a fluctuating saline shallow water table, which more nearly approximates the "real world".
4. Improvement in model accuracy for calcium chemistry.
5. Inclusion of the effect of salinity on soil hydraulic conductivity.

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APPENDICES

APPENDIX A

MONTHLY AMOUNTS OF ACTUAL EVAPOTRANSPIRATION FOR DIFFERENT TREATMENTS (LYSIMETER DATA)

MONTHLY AMOUNTS OF ACTUAL EVAPOTRANSPIRATION FOR WHEAT AND MAIZE TREATMENTS (LYSIMETER DATA)

Treatment	ET (mm) During					
Wheat-->	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.
Maize-->	Aug.	Sept.	Oct.			
Wheat						
NW050	4.5	26.4	60.9	90.1	103.4	110.0
NW100	6.1	38.2	67.8	75.9	112.5	126.3
NW150	2.0	19.1	43.0	49.1	82.8	104.3
MW050	0.1	14.6	32.5	46.3	65.0	70.6
MW100	0.1	16.2	43.0	46.7	54.8	65.0
MW150	0.1	5.7	25.2	27.6	50.8	58.5
Maize						
NM050	61.3	102.3	235.9			
NM100	44.3	106.0	202.2			
NM150	42.6	112.1	180.3			
MM050	15.8	63.4	171.7			
MM100	13 0	66.2	164.0			
MM150	6.9	60.0	119.8			

APPENDIX B

OBSERVED AND PREDICTED ION CONCENTRATIONS FOR THE LYSIMETER TREATMENTS

OBSERVED AND PREDICTED ION CONCENTRATIONS FOR THE LYSIMETER TREATMENTS

		Ca		Mg		Na	
Treat-ment	Depth mm	Observed mmol/l	Predicted mmol/l	Observed mmol/l	Predicted mmol/l	Observed mmol/l	Predicted mmol/l
NW050	0 - 150	70.15	33.61	29.85	12.11	174.63	97.31
NW050	300 - 450	13.43	11.53	6.42	4.72	35.22	29.62
NW100	0 - 150	36.42	25.91	14.03	11.81	91.04	91.52
NW100	750 - 900	19.70	15.67	8.36	5.75	53.31	39.12
NW150	0 - 150	23.13	22.38	9.70	7.25	57.01	52.65
NW150	1200 -1350	10.45	15.22	3.73	5.04	26.87	38.57
MW050	0 - 150	49.25	27.02	19.10	8.20	114.93	64.23
MW050	300 - 450	15.52	10.80	5.97	3.79	35.82	28.37
MW100	0 - 150	34.03	24.95	11.19	7.29	84.18	55.86
MW100	750 - 900	13.43	11.96	5.97	3.90	40.30	32.33
MW150	0 - 150	19.10	18.39	7.46	5.14	50.45	39.35
MW150	1200 -1350	10.44	13.26	3.88	4.10	114.93	34.65
NM050	0 - 150	36.27	31.45	14.18	10.98	100.00	88.36
NM050	300 - 450	24.92	13.88	8.66	5.64	56.72	35.34
NM100	0 - 150	33.13	27.76	11.64	8.61	25.37	65.40
NM100	750 - 900	15.67	16.54	6.72	5.57	40.30	41.84
NM150	0 - 150	18.96	19.12	8.51	5.83	51.34	42.15
NM150	1200 -1350	10.00	13.54	3.73	4.72	25.37	34.23
MM050	0 - 150	27.16	23.11	10.30	6.59	63.28	51.36
MM050	300 - 450	20.90	14.95	6.57	5.50	47.76	38.43
MM100	0 - 150	21.34	17.56	9.25	4.09	59.10	39.26
MM100	750 - 900	13.43	16.90	5.97	5.57	40.30	43.35
MM150	0 - 150	19.10	15.26	7.46	4.23	50.45	33.86
MM150	1200 -1350	10.60	12.68	3.88	4.23	25.37	32.32

Treat-ment	Depth mm	K Observed mmol/l	K Predicted mmol/l	Cl Observed mmol/l	Cl Predicted mmol/l	SO4 Observed mmol/l	SO4 Predicted mmol/l
NW050	0 - 150	17.91	7.82	204.48	131.89	35.07	9.08
NW050	300 - 450	11.94	3.64	41.19	36.21	29.85	5.95
NW100	0 - 150	13.43	7.10	98.51	130.35	24.63	9.35
NW100	750 - 900	9.55	4.60	57.31	48.15	12.69	7.97
NW150	0 - 150	9.55	4.55	76.12	72.16	14.93	8.69
NW150	1200 -1350	10.15	4.45	35.22	47.46	6.42	7.70
MW050	0 - 150	17.91	5.74	132.84	87.76	26.87	11.21
MW050	300 - 450	10.45	3.69	42.09	34.14	8.96	5.58
MW100	0 - 150	9.55	5.05	80.60	78.01	12.69	10.79
MW100	750 - 900	9.55	3.99	41.79	38.44	8.21	6.29
MW150	0 - 150	8.96	3.89	56.72	52.41	10.45	9.49
MW150	1200 -1350	9.55	4.10	32.24	42.26	6.42	6.75
NM050	0 - 150	9.25	8.10	82.09	120.67	16.41	8.83
NM050	300 - 450	6.87	4.15	56.72	43.41	11.49	7.15
NM100	0 - 150	8.66	5.47	79.40	93.54	23.88	9.74
NM100	750 - 900	5.97	4.78	42.69	51.40	9.40	8.40
NM150	0 - 150	5.97	3.68	63.28	60.00	10.15	7.30
NM150	1200 -1350	6.27	3.85	26.87	42.11	5.82	6.89
MM050	0 - 150	6.57	4.95	80.60	70.07	9.70	10.87
MM050	300 - 450	5.07	4.48	38.21	47.24	8.96	7.70
MM100	0 - 150	8.66	3.91	66.57	53.39	14.63	8.26
MM100	750 - 900	9.55	4.87	40.30	53.62	8.21	8.67
MM150	0 - 150	8.96	3.46	56.72	45.46	10.45	7.50
MM150	1200 -1350	9.55	3.77	32.24	39.67	6.42	6.40

APPENDIX C

RAINFALL, IRRIGATION AND EVAPOTRANSPIRATION DATA FOR DRIP AND FURROW IRRIGATED PLOTS

IRRIGATION AND RAINFALL DATE AND AMOUNT, AND IRRIGATION WATER CHEMICAL COMPOSITION FOR DRIP IRRIGATED PLOT (MAY 1, 1983 TO NOVEMBER 30, 1987)

Date	Amount (mm)	Ca	Mg	Na	K	Cl	SO_4	HCO_3
		mmol/l						
052383	60	0.30	0.20	0.80	0.04	0.70	0.30	0.54
060783	12	-	-	-	-	-	-	-
070883	80	22.56	16.24	50.22	0.30	26.90	62.59	0.00
072783	84	22.56	16.24	50.22	0.30	26.90	62.59	0.00
073183	30	22.56	16.24	50.22	0.30	26.90	62.59	0.00
080883	54	22.56	16.24	50.22	0.30	26.90	62.59	0.00
082383	15	22.56	16.24	50.22	0.30	26.90	62.59	0.00
082483	15	22.56	16.24	50.22	0.30	26.90	62.59	0.00
092883	18	-	-	-	-	-	-	-
092983	18	-	-	-	-	-	-	-
100783	9	-	-	-	-	-	-	-
101683	5	-	-	-	-	-	-	-
102483	5	-	-	-	-	-	-	-
121883	12	-	-	-	-	-	-	-
022083	6	-	-	-	-	-	-	-
022983	170	0.30	0.20	0.80	0.04	0.70	0.30	0.54
020984	7	-	-	-	-	-	-	-
022184	9	-	-	-	-	-	-	-
051084	20	0.30	0.20	0.80	0.04	0.70	0.30	0.54
070584	78	22.56	16.24	50.22	0.30	26.90	62.59	0.00
071984	30	22.56	16.24	50.22	0.30	26.90	62.59	0.00
072484	29	22.56	16.24	50.22	0.30	26.90	62.59	0.00
072584	8	-	-	-	-	-	-	-
073084	29	22.56	16.24	50.22	0.30	26.90	62.59	0.00
080384	24	22.56	16.24	50.22	0.30	26.90	62.59	0.00
080884	30	22.56	16.24	50.22	0.30	26.90	62.59	0.00
081584	42	22.56	16.24	50.22	0.30	26.90	62.59	0.00
082084	54	22.56	16.24	50.22	0.30	26.90	62.59	0.00
101284	13	-	-	-	-	-	-	-
111784	5	-	-	-	-	-	-	-
111884	9	-	-	-	-	-	-	-
112684	5	-	-	-	-	-	-	-
120484	12	-	-	-	-	-	-	-
120584	12	-	-	-	-	-	-	-
121284	6	-	-	-	-	-	-	-
121784	19	-	-	-	-	-	-	-
122084	6	-	-	-	-	-	-	-
122184	12	-	-	-	-	-	-	-
010785	20	-	-	-	-	-	-	-
010985	7	-	-	-	-	-	-	-
012885	85	0.30	0.20	0.80	0.04	0.70	0.30	0.54
030385	35	0.30	0.20	0.80	0.04	0.70	0.30	0.54

Date	Amount (mm)	Ca	Mg	Na	K	Cl	SO4	HCO_3
		mmol/l						
031085	48	0.30	0.20	0.80	0.04	0.70	0.30	0.54
031185	11	-	-	-	-	-	-	-
031885	7	-	-	-	-	-	-	-
032785	45	0.30	0.20	0.80	0.04	0.70	0.30	0.54
041885	118	0.30	0.20	0.80	0.04	0.70	0.30	0.54
050285	46	0.30	0.20	0.80	0.04	0.70	0.30	0.54
081685	40	0.30	0.20	0.80	0.04	0.70	0.30	0.54
092985	40	0.30	0.20	0.80	0.04	0.70	0.30	0.54
100785	115	0.30	0.20	0.80	0.04	0.70	0.30	0.54
102185	14	-	-	-	-	-	-	-
111085	11	-	-	-	-	-	-	-
111185	19	-	-	-	-	-	-	-
112485	8	-	-	-	-	-	-	-
112585	9	-	-	-	-	-	-	-
112985	10	-	-	-	-	-	-	-
120685	6	-	-	-	-	-	-	-
010386	5	-	-	-	-	-	-	-
010486	8	-	-	-	-	-	-	-
013186	9	-	-	-	-	-	-	-
020386	9	-	-	-	-	-	-	-
021286	16	-	-	-	-	-	-	-
021386	6	-	-	-	-	-	-	-
021586	17	-	-	-	-	-	-	-
030886	10	-	-	-	-	-	-	-
031186	6	-	-	-	-	-	-	-
031386	5	-	-	-	-	-	-	-
031586	22	-	-	-	-	-	-	-
040686	6	-	-	-	-	-	-	-
050186	73	23.53	17.10	53.14	0.31	20.62	64.21	0.00
051586	49	23.53	17.10	53.14	0.31	20.62	64.21	0.00
052086	26	23.53	17.10	53.14	0.31	20.62	64.21	0.00
052386	39	22.92	16.56	51.33	0.30	19.32	63.20	0.00
052986	92	21.11	14.93	45.84	0.29	17.55	60.16	0.00
060386	109	23.24	16.84	52.26	0.31	26.20	63.72	0.00
061186	30	23.24	16.84	52.26	0.31	26.20	63.72	0.00
062286	48	25.18	18.58	58.10	0.32	27.21	66.95	0.00
062586	39	20.96	17.49	54.43	0.31	27.40	64.92	0.00
070786	40	20.85	16.35	46.85	0.26	32.40	66.00	0.00
071186	62	20.85	16.35	46.85	0.26	32.40	66.00	0.00
071886	41	20.12	16.70	52.24	0.36	28.10	60.10	0.00
072886	44	20.43	16.44	50.67	0.39	28.00	61.80	0.00
092486	5	-	-	-	-	-	-	-
111886	5	-	-	-	-	-	-	-
122086	170	0.30	0.20	0.80	0.04	0.70	0.30	0.54
010387	15	-	-	-	-	-	-	-
010487	10	-	-	-	-	-	-	-

Date	Amount (mm)	Ca	Mg	Na	K	Cl	SO_4	HCO_3
		mmol/l						
013087	7	-	-	-	-	-	-	-
020987	11	-	-	-	-	-	-	-
021287	10	-	-	-	-	-	-	-
021387	14	-	-	-	-	-	-	-
030587	32	-	-	-	-	-	-	-
042287	10	-	-	-	-	-	-	-
050887	6	-	-	-	-	-	-	-
070287	24	22.33	17.49	53.85	0.27	29.40	51.40	0.00
070687	65	22.33	17.49	53.85	0.27	29.40	51.40	0.00
072087	9	22.33	17.49	53.85	0.27	29.40	51.40	0.00
072287	3	22.33	17.49	53.85	0.27	29.40	51.40	0.00
072487	58	22.33	17.49	53.85	0.27	29.40	51.40	0.00
072687	57	22.33	17.49	53.85	0.27	29.40	51.40	0.00
072887	42	22.33	17.49	53.85	0.27	29.40	51.40	0.00
080687	16	25.35	18.34	58.29	0.31	33.60	76.00	0.00
080987	56	25.35	18.34	58.29	0.31	33.60	76.00	0.00
081687	52	25.35	18.34	58.29	0.31	33.60	76.00	0.00
082387	58	23.97	15.82	49.28	0.26	28.90	65.00	0.00
102287	9	-	-	-	-	-	-	-
102787	8	-	-	-	-	-	-	-
102887	10	-	-	-	-	-	-	-
102987	14	-	-	-	-	-	-	-
111987	6	-	-	-	-	-	-	-
112287	6	-	-	-	-	-	-	-
120687	10	-	-	-	-	-	-	-
123087	8	-	-	-	-	-	-	-

IRRIGATION AND RAINFALL DATE AND AMOUNT, AND IRRIGATION WATER COMPOSITION FOR FURROW IRRIGATED PLOT (MAY 1, 1983 TO AUGUST 31, 1986)

Date	Amount (mm)	Ca	Mg	Na	K	Cl	SO_4	HCO_3
		-----	-----	-----	mmol/l	-----	-----	-----
052383	60	0.30	0.20	0.80	0.04	0.70	0.30	0.54
060783	12	-	-	-	-	-	-	-
070883	80	0.30	0.20	0.80	0.30	0.70	0.30	0.54
080383	135	0.30	0.20	0.80	0.04	0.70	0.30	0.54
092883	18	-	-	-	-	-	-	-
092983	18	-	-	-	-	-	-	-
100783	9	-	-	-	-	-	-	-
101683	5	-	-	-	-	-	-	-
102483	5	-	-	-	-	-	-	-
121883	12	-	-	-	-	-	-	-
122083	6	-	-	-	-	-	-	-
122983	170	0.30	0.20	0.80	0.04	0.70	0.30	0.54
020984	7	-	-	-	-	-	-	-
022184	9	-	-	-	-	-	-	-
051084	20	0.30	0.20	0.80	0.04	0.70	0.30	0.54
070584	109	0.30	0.20	0.80	0.04	0.70	0.30	0.54
072584	8	-	-	-	-	-	-	-
072584	109	0.30	0.20	0.80	0.04	0.70	0.30	0.54
080284	109	0.30	0.20	0.80	0.04	0.70	0.30	0.54
081684	109	0.30	0.20	0.80	0.04	0.70	0.30	0.54
090584	109	0.30	0.20	0.80	0.04	0.70	0.30	0.54
101284	13	-	-	-	-	-	-	-
111784	5	-	-	-	-	-	-	-
111884	9	-	-	-	-	-	-	-
112684	5	-	-	-	-	-	-	-
120484	12	-	-	-	-	-	-	-
120584	12	-	-	-	-	-	-	-
121284	6	-	-	-	-	-	-	-
121784	19	-	-	-	-	-	-	-
122084	6	-	-	-	-	-	-	-
122184	12	-	-	-	-	-	-	-
010785	20	-	-	-	-	-	-	-
010985	7	-	-	-	-	-	-	-
012885	85	0.30	0.20	0.80	0.04	0.70	0.30	0.54
030685	104	0.30	0.20	0.80	0.04	0.70	0.30	0.54
031185	11	-	-	-	-	-	-	-
031885	7	-	-	-	-	-	-	-
040885	106	0.30	0.20	0.80	0.04	0.70	0.30	0.54
042785	106	0.30	0.20	0.80	0.04	0.70	0.30	0.54
081685	40	0.30	0.20	0.80	0.04	0.70	0.30	0.54
092985	40	0.30	0.20	0.80	0.04	0.70	0.30	0.54
100785	98	0.30	0.20	0.80	0.04	0.70	0.30	0.54

Date	Amount (mm)	Ca	Mg	Na	K	Cl	SO_4	HCO_3
		-----	-----	-----	mmol/l	-----	-----	-----
102185	14	-	-	-	-	-	-	-
111085	11	-	-	-	-	-	-	-
111185	19	-	-	-	-	-	-	-
112485	8	-	-	-	-	-	-	-
112585	9	-	-	-	-	-	-	-
112985	10	-	-	-	-	-	-	-
120685	6	-	-	-	-	-	-	-
010386	5	-	-	-	-	-	-	-
010486	8	-	-	-	-	-	-	-
013186	9	-	-	-	-	-	-	-
020386	9	-	-	-	-	-	-	-
021286	16	-	-	-	-	-	-	-
021386	6	-	-	-	-	-	-	-
021586	17	-	-	-	-	-	-	-
030886	10	-	-	-	-	-	-	-
031186	6	-	-	-	-	-	-	-
031386	5	-	-	-	-	-	-	-
031586	22	-	-	-	-	-	-	-
040686	6	-	-	-	-	-	-	-
041186	101	0.30	0.20	0.80	0.04	0.70	0.30	0.54
050586	101	0.30	0.20	0.80	0.04	0.70	0.30	0.54
052486	101	0.30	0.20	0.80	0.04	0.70	0.30	0.54
060686	101	0.30	0.20	0.80	0.04	0.70	0.30	0.54
062486	101	0.30	0.20	0.80	0.04	0.70	0.30	0.54
070186	101	0.30	0.20	0.80	0.04	0.70	0.30	0.54
071586	101	0.30	0.20	0.80	0.04	0.70	0.30	0.54
092486	5	-	-	-	-	-	-	-
111886	5	-	-	-	-	-	-	-

WEEKLY EVAPOTRANSPIRATION (ET) FOR
FURROW AND DRIP IRRIGATED PLOTS
(FROM MAY 1, 1983 TO NOVEMBER 30, 1987)

Week no.	ET (mm)	Week no.	ET (mm)	Week no.	ET (mm)
1	1.8	2	2.3	3	2.1
4	5.0	5	9.0	6	12.0
7	14.5	8	14.5	9	21.3
10	22.7	11	26.2	12	29.7
13	34.2	14	36.1	15	38.3
16	37.2	17	37.1	18	37.6
19	31.1	20	35.8	21	29.1
22	17.3	23	13.5	24	7.8
25	5.0	26	3.2	27	0.6
28	0.9	29	0.8	30	0.9
31	0.9	32	0.7	33	0.4
34	0.4	35	0.3	36	0.3
37	0.2	38	0.5	39	0.6
40	0.7	41	0.7	42	0.9
43	1.0	44	1.2	45	1.3
46	1.2	47	1.7	48	2.1
49	1.7	50	1.8	51	1.7
52	5.1	53	9.6	54	14.0
55	17.9	56	21.8	57	26.4
58	30.7	59	36.3	60	40.6
61	46.0	62	51.9	63	52.4
64	48.9	65	44.4	66	46.4
67	45.0	68	37.0	69	31.9
70	29.1	71	24.7	72	17.7
73	12.0	74	7.3	75	1.5
76	1.3	77	1.4	78	1.2
79	1.1	80	0.8	81	0.6
82	0.4	83	0.6	84	0.3
85	0.5	86	0.3	87	0.2
88	0.2	89	0.3	90	0.5
91	0.9	92	4.0	93	5.7
94	10.2	95	16.6	96	18.3
97	17.1	98	22.7	99	24.3
100	27.4	101	37.6	102	39.6
103	34.6	104	52.0	105	46.3
106	41.8	107	50.6	108	54.0
109	31.9	110	25.5	111	18.8
112	2.7	113	2.6	114	2.6
115	2.3	116	2.3	117	2.3
118	2.2	119	2.1	120	1.7
121	1.9	122	1.9	123	1.5
124	1.4	125	1.4	126	1.4
127	1.2	128	1.2	129	1.0
130	0.9	131	1.2	132	1.3

Week no.	ET (mm)	Week no.	ET (mm)	Week no.	ET (mm)
133	0.8	134	1.2	135	0.6
136	0.6	137	1.3	138	0.9
139	1.4	140	0.3	141	0.2
142	1.7	143	2.5	144	2.5
145	3.8	146	4.1	147	5.0
148	7.9	149	10.5	150	7.9
151	16.5	152	22.0	153	23.8
154	25.5	155	32.4	156	43.4
157	38.9	158	43.7	159	56.0
160	54.2	161	56.2	162	52.1
163	55.8	164	55.9	165	58.1
166	47.6	167	45.9	168	45.9
169	43.0	170	44.5	171	40.8
172	40.8	173	40.8	174	2.0
175	1.8	176	1.7	177	1.7
178	1.2	179	1.2	180	1.7
181	0.9	182	1.1	183	1.0
184	1.3	185	0.9	186	0.8
187	0.8	188	0.5	189	0.3
190	0.4	191	0.2	192	0.2
193	0.4	194	0.6	195	0.6
196	0.6	197	0.6	198	0.6
199	1.2	200	1.0	201	0.9
202	1.1	203	1.3	204	1.5
205	1.5	206	2.1	207	2.2
208	2.1	209	1.9	210	6.0
211	11.8	212	8.2	213	11.6
214	17.2	215	23.9	216	25.3
217	30.8	218	33.6	219	38.6
220	44.3	221	40.3	222	44.4
223	46.1	224	38.0	225	37.4
226	33.6	227	27.5	228	19.7
229	16.8	230	14.2	231	10.1
232	5.4	233	1.5	234	0.9
235	0.6	236	0.6	237	0.5
238	0.4	239	0.5	240	0.4
241	0.6	242	0.6	243	0.5

APPENDIX D

MEASURED AND PREDICTED VOLUMETRIC WATER CONTENT AND SOIL CHEMICAL COMPOSITION FOR DRIP AND FURROW PLOTS

MEASURED AND PREDICTED VOLUMETRIC WATER CONTENT FOR DRIP PLOT

Depth (mm)	06/20/1983		10/10/1983		07/23/1984		01/28/1985		05/09/1985		08/01/1986	
	Meas- ured	Pred- icted	Meas- ured	Pred- icted	Meas- ured	Pred- icted	Meas- ured	Pred- icted	Meas- ured	Pred- icted	Meas- ured	Pred- icted
75		0.421		0.409		0.387		0.432		0.414		0.423
225		0.424		0.412		0.390		0.437		0.418		0.427
375		0.430		0.416		0.394		0.444		0.423		0.433
450	0.364		0.256		0.374		*		*		*	
525		0.435		0.420		0.396		0.450		0.427		0.439
675		0.434		0.420		0.400		0.449		0.427		0.443
750	0.398		0.288		0.387		*		*		*	
825		0.440		0.424		0.402		0.456		0.431		0.443
975		0.439		0.422		0.400		0.455		0.430		0.443
1125		0.446		0.426		0.402		0.460		0.435		0.450
1275		0.449		0.422		0.391		0.462		0.435		0.453
1350	0.405		0.375		0.364		*		*		*	
1425		0.456		0.429		0.394		0.465		0.443		0.459
1525		0.442		0.418		0.382		0.446		0.432		0.444

Note: * Representative observed data not available.

MEASURED AND PREDICTED VOLUMETRIC WATER CONTENT FOR FURROW PLOT

Depth (mm)	06/27/1983		08/08/1983		07/05/1984		09/11/1984		01/28/1985		04/22/1986	
	Meas-ured	Pred-icted	Meas-ured	Pred-icted	Meas-ured	Pred-icted	Meas-ured	Pred-icted	Meas-ured	Pred-icted	Meas-ured	Pred-icted
75		0.429		0.430		0.428		0.431		0.432		0.429
225		0.433		0.433		0.432		0.435		0.436		0.433
375		0.380		0.381		0.378		0.382		0.384		0.380
450	0.403		0.392		0.391		*		*		*	
525		0.388		0.388		0.387		0.426		0.391		0.388
675		0.425		0.425		0.423		0.433		0.427		0.424
750	0.376		0.383		0.376		*		*		*	
825		0.432		0.432		0.431		0.433		0.434		0.431
975		0.386		0.385		0.384		0.387		0.389		0.385
1125		0.402		0.402		0.400		0.403		0.404		0.401
1275		0.412		0.411		0.410		0.413		0.414		0.411
1350	0.423		0.427		0.422		*		*		*	
1425		0.440		0.440		0.439		0.440		0.441		0.439
1525		0.440		0.439		0.439		0.440		0.440		0.439

Note: * Representative observed data not available.

MEASURED AND PREDICTED SOIL CHEMICAL COMPOSITION FOR
DRIP IRRIGATED PLOT

Depth (mm)	Measured	Predicted	Measured	Predicted	Measured	Predicted	Measured	Predicted
	Ca (mmol/l)							
	March 13, 1984		November 8, 1984		March 20, 1985		October 14, 1985	
75	-	6.7	-	5.9	-	6.9	-	7.5
225	4.2	6.7	12.6	6.2	8.2	6.5	12.7	7.1
375	-	6.6	-	6.3	-	6.3	-	6.7
525	3.4	6.5	15.7	6.5	17.5	6.1	14.9	6.4
675	-	6.8	-	6.6	-	6.2	-	6.2
825	2.0	7.1	19.2	6.7	14.7	6.4	16.4	6.2
975	-	7.0	-	6.3	-	6.4	-	6.0
1125	2.7	7.1	14.8	6.1	14.0	6.5	17.1	6.0
1275	-	7.3	-	6.3	-	6.7	-	6.2
1425	3.2	7.6	13.5	6.8	13.7	7.1	17.9	6.7
1575	-	7.2	-	6.7	-	6.9	-	6.6
	March 23, 1986		October 29, 1986		March 22, 1987		November 29, 1987	
75	-	7.40	-	5.59	-	6.47	-	6.56
225	5.1	6.92	20.5	6.03	8.5	6.21	13.1	6.75
375	-	6.38	-	5.94	-	5.96	-	6.77
525	16.4	5.97	15.2	5.74	12.1	5.78	16.1	6.4
675	-	5.80	-	5.47	-	5.66	-	5.96
825	13.2	5.87	13.8	5.35	13.2	5.67	12.2	5.7
975	-	5.83	-	5.08	-	5.49	-	5.41
1125	15.0	5.93	13.0	5.17	14.1	5.56	15.8	5.37

Depth (mm)	Measured	Predicted	Measured	Predicted	Measured	Predicted	Measured	Predicted
1275	-	6.21	-	5.49	-	5.76	-	5.56
1425	14.0	6.62	13.8	6.14	14.7	6.18	12.5	6.11
1575	-	6.50	-	6.32	-	6.12	-	6.12
				Mg (mmol/l)				
	March 13, 1984		November 8, 1984		March 20, 1985		October 14, 1985	
75	-	5.21	-	9.07	-	4.68	-	3.8
225	0.9	4.82	4.2	7.11	2.4	5.99	3.0	5.17
375	-	3.72	-	5.42	-	5.64	-	5.73
525	0.7	3.15	5.8	4.44	4.5	4.76	3.4	5.73
675	-	3.18	-	4.38	-	4.35	-	5.81
825	0.6	3.48	5.4	4.76	3.8	4.36	3.4	6.00
975	-	3.75	-	4.94	-	4.34	-	5.82
1125	0.8	3.72	5.0	4.73	0.0	4.31	4.2	5.62
1275	-	3.28	-	4.04	-	4.32	-	5.41
1425	0.8	2.97	5.8	3.67	5.2	4.45	4.9	5.45
1575	-	2.74	-	3.99	-	4.78	-	5.55
	March 23, 1986		October 29, 1986		March 22, 1987		November 29, 1987	
75	-	2.95	-	11.62	-	6.47	-	9.98
225	1.4	4.22	4.7	8.13	3.1	7.57	5.1	11.63
375	-	4.79	-	7.18	-	7.36	-	11.88
525	3.4	4.73	2.8	6.95	5.7	6.87	5.8	11.07
675	-	4.77	-	7.28	-	6.71	-	10.18
825	3.2	4.85	2.6	7.99	5.7	6.87	6.7	9.63

Depth (mm)	Measured	Predicted	Measured	Predicted	Measured	Predicted	Measured	Predicted
975	-	4.80	-	8.14	-	6.87	-	9.04
1125	3.1	4.93	2.6	7.97	5.9	7.12	4.9	8.95
1275	-	5.22	-	7.50	-	7.57	-	8.93
1425	3.3	5.82	4.3	7.12	8.8	8.10	7.5	8.96
1575	-	6.18	-	6.45	-	7.91	-	8.10
Na (mmol/l)								
	March 13, 1984		November 8, 1984		March 20, 1985		October 14, 1985	
75	-	23.07	-	40.87	-	15.55	-	12.62
225	9.1	29.08	33.7	42.16	24.4	29.20	30.3	23.07
375	-	33.34	-	44.56	-	40.31	-	37.32
525	17.3	38.06	76.0	50.50	94.3	47.51	72.2	53.32
675	-	46.22	-	63.45	-	56.92	-	71.22
825	23.0	57.86	135.3	82.77	120.6	69.97	122.5	93.45
975	-	68.68	-	101.02	-	82.51	-	109.73
1125	30.6	80.45	119.0	112.50	100.5	95.81	128.2	120.22
1275	-	89.00	-	108.20	-	104.77	-	117.73
1425	35.6	92.29	112.4	90.53	100.8	106.71	125.9	103.19
1575	-	79.11	-	61.36	-	89.96	-	74.28
	March 23, 1986		October 29, 1986		March 22, 1987		November 29, 1987	
75	-	8.3	-	47.63	-	22.79	-	37.24
225	16.7	17.11	53.4	39.40	20.8	33.43	40.2	49.24
375	-	28.45	-	42.23	-	40.74	-	58.28
525	48.9	39.84	87.5	52.86	73.4	48.72	81.6	67.41

Depth (mm)	Measured	Predicted	Measured	Predicted	Measured	Predicted	Measured	Predicted
675	-	53.04	-	74.14	-	61.63	-	80.77
825	106.3	69.36	106.2	102.72	98.5	81.39	123.5	99.33
975	-	83.61	-	126.91	-	99.40	-	115.34
1125	139.7	98.03	106.5	139.72	106.1	117.15	114.2	129.44
1275	-	108.14	-	132.13	-	127.85	-	134.29
1425	‘35.6	112.85	122.3	109.99	141.1	129.00	106.6	127.96
1575	-	99.08	-	73.85	-	107.30	-	99.46

Cl(mmol/l)

	March 13, 1984		November 8, 1984		March 20, 1985		October 14, 1985	
75	-	9.26	-	23.65	-	3.10	-	3.68
225	5.8	12.55	29.5	26.00	12.5	8.27	8.9	7.97
375	-	14.89	-	28.35	-	15.13	-	14.45
525	6.3	15.88	40.7	31.20	59.7	21.27	28.3	23.60
675	-	17.20	-	35.97	-	27.93	-	35.10
825	7.1	19.96	58.1	43.16	41.1	34.58	59.8	48.34
975	-	23.58	-	48.74	-	39.46	-	56.60
1125	7.0	28.41	55.1	50.96	49.9	44.01	72.5	59.53
1275	-	32.62	-	46.38	-	47.15	-	55.41
1425	7.0	35.12	59.1	37.70	51.1	48.44	74.7	46.94
1575	-	31.76	-	26.43	-	42.72	-	34.05

	March 23, 1986		October 29, 1986		March 22, 1987		November 29, 1987	
75	-	1.67	-	38.03	-	7.82	-	19.52
225	5.5	4.22	26.3	30.77	7.6	14.75	24.1	30.12

Depth (mm)	Measured	Predicted	Measured	Predicted	Measured	Predicted	Measured	Predicted
375	-	8.04	-	31.16	-	21.90	-	37.07
525	7.3	12.31	37.5	35.64	22.8	28.04	48.2	42.06
675	-	18.11	-	44.32	-	34.41	-	48.1
825	36.4	25.96	47.1	56.19	47.0	42.24	57.9	56.25
975	-	33.95	-	64.60	-	48.88	-	62.30
1125	70.0	42.31	45.2	67.15	64.2	55.58	42.1	67.13
1275	-	48.97	-	59.79	-	60.14	-	67.52
1425	81.7	53.54	71.5	47.22	89.7	61.58	56.2	63.05
1575	-	49.76	-	31.30	-	53.49	-	48.58
				SO_4 (mmol/l)				
	March 13, 1984		November 8, 1984		March 20, 1985		October 14, 1985	
75	-	20.57	-	31.85	-	18.26	-	16.07
225	7.0	21.80	20.2	29.16	18.1	24.87	23.2	20.99
375	-	20.81	-	25.81	-	27.97	-	25.92
525	8.2	19.89	38.6	23.37	39.0	28.16	36.0	30.01
675	-	20.65	-	24.23	-	28.93	-	33.96
825	6.5	22.99	52.7	28.48	41.3	31.31	45.7	39.76
975	-	25.45	-	34.38	-	33.73	-	44.01
1125	13.8	28.76	48.3	41.08	37.5	37.31	42.4	48.17
1275	-	31.32	-	44.18	-	40.33	-	49.81
1425	16.7	34.13	44.7	43.01	38.9	42.19	38.9	48.14
1575	-	32.20	-	35.56	-	38.25	-	40.10
	March 23, 1986		October 29, 1986		March 22, 1987		November 29, 1987	
75	-	13.64	-	40.06	-	23.35	-	26.92

Depth (mm)	Measured	Predicted	Measured	Predicted	Measured	Predicted	Measured	Predicted
225	12.4	18.07	45.8	31.87	22.9	29.10	24.2	28.93
375	-	22.40	-	30.24	-	31.55	-	28.69
525	44.4	25.92	50.4	31.80	44.5	33.28	44.6	30.40
675	-	29.99	-	38.00	-	37.05	-	36.44
825	54.7	35.22	55.4	47.75	45.4	43.73	53.1	46.05
975	-	39.26	-	56.73	-	49.45	-	54.47
1125	54.8	43.67	55.8	62.50	43.4	55.82	51.5	61.82
1275	-	47.23	-	61.80	-	60.14	-	65.40
1425	50.8	49.84	51.1	56.17	49.3	61.85	45.3	64.25
1575	-	45.62	-	43.44	-	53.30	-	53.11

EC (dS/m)

	March 13, 1984		November 8, 1984		March 20, 1985		October 14, 1985	
75	-	5.16	-	8.63	-	4.07	-	3.85
225	1.7	5.69	5.4	8.42	3.72	5.68	4.41	5.14
375	-	5.66	-	8.00	-	6.80	-	6.55
525	2.23	5.58	8.96	7.69	11.28	7.45	8.23	8.04
675	-	6.32	-	8.04	-	8.17	-	9.71
825	2.69	7.47	13.81	9.69	12.82	9.15	13.39	11.82
975	-	8.44	-	11.01	-	9.86	-	13.13
1125	3.48	9.41	12.67	11.74	11.04	10.72	14.13	13.96
1275	-	10.04	-	12.00	-	11.46	-	13.87
1425	3.83	10.21	12.39	11.34	11.22	11.99	14.13	13.01
1575	-	8.87	-	9.33	-	10.99	-	10.70

Depth (mm)	Measured	Predicted	Measured	Predicted	Measured	Predicted	Measured	Predicted
	March 23, 1986		October 29, 1986		March 22, 1987		November 29, 1987	
75	-	3.16	-	11.73	-	5.52	-	7.21
225	2.61	4.17	9.03	9.58	4.71	7.27	7.37	8.58
375	-	5.19	-	9.24	-	8.42	-	9.12
525	6.7	6.10	11.47	9.75	9.32	9.28	10.94	9.77
675	-	7.25	-	11.37	-	10.42	-	11.32
825	10.98	8.81	13.14	13.81	11.76	12.11	17.39	13.65
975	-	10.19	-	15.76	-	13.46	-	15.48
1125	15.15	11.66	13.09	16.81	14.08	14.95	13.80	17.04
1275	-	12.90	-	16.14	-	16.03	-	17.67
1425	15.27	13.88	15.49	14.37	16.26	16.58	13.96	17.19
1575	-	12.99	-	11.05	-	14.59	-	14.16

MEASURED AND PREDICTED SOIL CHEMICAL COMPOSITION FOR
FURROW IRRIGATED PLOT

Depth (mm)	Measured	Predicted	Measured	Predicted	Measured	Predicted	Measured	Predicted
				Ca (mmol/l)				
	March 13, 1984		November 8, 1984		March 20, 1985		August 30, 1986	
75	-	8.05	-	7.88	-	8.28	-	8.75
225	7.7	8.19	19.8	7.95	6.8	7.82	13.6	8.59
375	-	7.37	-	7.06	-	6.46	-	7.30
525	8.4	7.83	54.1	7.29	7.0	6.46	12.2	7.27
675	-	8.84	-	8.42	-	7.15	-	7.75
825	10.7	9.43	30.4	9.00	16.2	7.44	12.1	7.81
975	-	9.07	-	8.72	-	7.24	-	6.94
1125	15.9	9.91	30.6	9.52	12.8	8.15	12.5	7.17
1275	-	10.25	-	10.18	-	9.05	-	7.64
1425	15.8	11.90	29.6	11.59	12.7	10.56	13.3	9.22
1575	-	12.26	-	11.79	-	10.92	-	10.13
				Mg (mmol/l)				
	March 13, 1984		November 8, 1984		March 20, 1985		August 30, 1986	
75	-	3.14	-	2.55	-	1.95	-	1.83
225	1.7	3.47	0.9	2.87	5.6	2.39	3.5	1.67
375	-	2.63	-	2.53	-	2.05	-	1.89
525	2.7	2.77	6.7	2.83	6.1	2.23	3.0	2.33
675	-	3.73	-	3.91	-	2.88	-	3.30

Depth (mm)	Measured	Predicted	Measured	Predicted	Measured	Predicted	Measured	Predicted
825	3.4	4.34	5.1	4.65	8.6	3.35	3.4	4.59
975	-	4.53	-	5.36	-	3.83	-	6.76
1125	4.6	5.61	4.6	7.44	7.2	5.41	3.3	10.94
1275	-	6.46	-	9.34	-	7.44	-	13.12
1425	5.5	7.72	4.3	10.88	6.8	9.54	2.9	12.92
1575	-	8.09	-	10.37	-	9.98	-	10.60
				Na (mmol/l)				
	March 13, 1984		November 8, 1984		March 20, 1985		August 30, 1986	
75	-	15.87	-	13.80	-	5.62	-	5.26
225	12.7	24.44	14.5	21.10	8.0	11.40	34.7	6.50
375	-	30.90	-	27.49	-	17.29	-	10.45
525	59.3	42.34	102.7	40.13	39.4	27.63	59.8	19.7
675	-	57.49	-	59.66	-	41.76	-	37.84
825	111.1	69.30	114.2	74.28	90.4	53.01	93.7	60.81
975	-	74.62	-	85.24	-	61.38	-	88.11
1125	130.4	91.16	96.7	108.86	91.4	82.58	103.2	122.02
1275	-	99.57	-	116.14	-	99.73	-	120.00
1425	116.4	102.84	57.8	108.69	79.5	110.09	98.0	89.09
1575	-	84.07	-	78.89	-	96.01	-	50.67
				Cl (mmol/l)				
	March 13, 1984		November 8, 1984		March 20, 1985		August 30, 1986	
75	-	2.25	-	2.31	-	0.53	-	1.71

Depth (mm)	Measured	Predicted	Measured	Predicted	Measured	Predicted	Measured	Predicted
225	3.3	4.00	3.8	3.83	3.4	0.84	21.7	1.67
375	-	5.95	-	6.06	-	1.37	-	2.89
525	10.0	9.67	38.2	11.20	7.8	3.09	19.7	6.19
675	-	15.76	-	19.31	-	6.61	-	13.40
825	32.6	22.15	39.4	27.68	53.9	10.91	28.1	25.48
975	-	27.15	-	36.23	-	15.95	-	39.88
1125	49.1	36.65	31.3	51.53	31.2	26.33	39.9	56.16
1275	-	44.10	-	60.25	-	37.62	-	56.18
1425	50.4	50.43	16.0	61.87	29.9	47.28	40.5	44.50
1575	-	47.14	-	49.97	-	45.96	-	30.01

SO_4 (mmol/l)

	March 13, 1984		November 8, 1984		March 20, 1985		August 30, 1986	
75	-	14.92	-	14.33	-	12.00	-	11.23
225	11.7	16.55	11.4	16.20	14.9	14.44	22.9	11.69
375	-	15.37	-	15.64	-	15.24	-	11.82
525	30.8	16.85	65.3	17.73	24.3	18.68	41.7	14.54
675	-	19.61	-	21.17	-	23.19	-	20.12
825	50.8	20.78	50.2	22.65	82.6	25.42	53.1	25.41
975	-	20.38	-	22.80	-	25.42	-	32.11
1125	64.9	23.87	43.5	27.33	61.3	29.79	53.4	44.69
1275	-	26.54	-	30.26	-	32.64	-	47.90
1425	57.5	28.84	46.8	31.77	71.3	35.15	50.4	41.90
1575	-	26.24	-	27.97	-	32.29	-	30.09

Depth (mm)	Measured	Predicted	Measured	Predicted	Measured	Predicted	Measured	Predicted
	EC(dS/m)							
	March 13, 1984		November 8, 1984		March 20, 1985		August 30, 1986	
75	-	4.00	-	3.66	-	2.85	-	2.95
225	2.08	4.91	1.38	4.39	1.31	3.30	5.39	2.99
375	-	5.15	-	4.71	-	3.39	-	3.08
525	6.60	6.35	11.21	6.02	3.02	4.28	7.25	3.98
675	-	8.20	-	8.26	-	5.77	-	5.86
825	9.58	9.59	10.90	9.93	8.78	6.97	9.93	8.14
975	-	10.07	-	11.05	-	7.83	-	10.61
1125	13.98	12.01	9.60	13.81	8.53	10.34	11.09	14.14
1275	-	13.06	-	14.99	-	12.57	-	14.47
1425	11.76	14.01	6.63	15.04	7.66	14.40	10.71	12.39
1575	-	12.53	-	12.32	-	13.41	-	9.06

APPENDIX E

PREDICTED ION CONCENTRATIONS, ESP, SAR, EC AND DISSOLVED CATIONS OF THE SOIL PROFILE FOR 96 TREATMENTS (MODEL APPLICATION)

PREDICTED ION CONCENTRATIONS, ESP, SAR, EC, AND DISSOLVED CATIONS OF THE SOIL PROFILE FOR TREATMENT NO. 01 (WATER TABLE DEPTH 1000 MM; WATER TABLE EC 2 DS/M; SANDY LOAM SOIL; COTTON CROP; 14 DAYS IRRIGATION INTERVAL WITH IRRIGATION APPLICATION AMOUNT AS 0.75 OF ET)

End of Year	Depth (mm)	Theta (cm3/cm3)	Ca	Mg	Na	K	Cl	SO4	ESP	SAR	EC (ds/m)	Diss. Cat. (meq/l)
			mmol/l									
1	50	.3205	.07	.00	2.19	.13	.93	.53	3.7	6.2	.3	2.5
	150	.3263	.07	.07	3.03	.20	1.28	.81	4.2	6.9	.4	3.5
	250	.3324	.21	.07	4.53	.27	1.85	1.37	4.5	7.3	.6	5.3
	350	.3394	.35	.14	6.45	.35	2.73	2.24	4.8	7.4	.9	7.9
	450	.3477	.72	.29	8.84	.50	3.81	3.38	5.0	7.3	1.3	11.4
	550	.3580	1.26	.52	11.54	.67	5.25	4.81	5.2	7.4	1.7	15.9
	650	.3714	2.15	.92	14.96	.84	7.29	6.75	5.4	7.4	2.4	21.9
	750	.3901	4.03	1.69	19.99	1.13	10.88	9.59	5.6	7.5	3.5	32.6
	850	.4197	6.94	2.95	25.58	1.56	15.70	13.09	5.7	7.5	5.1	47.0
	950	.4742	8.52	3.72	24.00	1.57	16.75	13.23	5.2	6.9	5.7	50.0
2	50	.3222	.07	.00	1.53	.13	.67	.27	2.8	4.7	.2	1.8
	150	.3274	.07	.00	1.76	.14	.74	.34	3.7	6.4	.2	2.0
	250	.3334	.07	.00	2.14	.14	.90	.41	4.3	7.4	.3	2.3
	350	.3404	.07	.00	2.60	.14	1.05	.56	4.6	7.9	.4	3.0
	450	.3488	.07	.07	3.46	.22	1.44	.86	4.8	7.9	.5	4.0
	550	.3591	.22	.07	5.05	.30	2.15	1.41	4.9	7.9	.7	6.0
	650	.3722	.62	.31	8.07	.46	3.61	2.54	4.8	7.4	1.2	10.4
	750	.3905	1.78	.73	12.83	.81	6.45	4.68	5.0	7.2	2.1	18.7
	850	.4198	3.64	1.56	18.04	1.13	10.15	7.29	5.3	7.4	3.4	29.7
	950	.4742	5.68	2.55	20.97	1.27	13.23	9.50	5.3	7.2	4.4	38.7
3	50	.3312	.07	.07	1.71	.21	.82	.34	2.3	3.9	.3	2.2
	150	.3367	.07	.00	2.23	.14	.97	.42	3.5	5.8	.3	2.6
	250	.3422	.07	.00	2.76	.14	1.13	.57	4.3	7.3	.4	3.1
	350	.3480	.07	.07	3.45	.22	1.44	.72	4.7	7.8	.5	4.0
	450	.3546	.22	.07	4.76	.29	2.05	1.10	4.8	7.7	.7	5.6
	550	.3630	.60	.23	7.50	.45	3.45	2.10	4.6	7.1	1.1	9.7
	650	.3744	2.01	.85	12.53	.85	6.65	4.25	4.5	6.5	2.2	19.1
	750	.3914	4.85	2.10	19.00	1.29	11.73	7.60	4.8	6.6	3.9	34.1
	850	.4201	7.29	3.21	23.09	1.56	15.62	10.16	4.9	6.6	5.2	45.7
	950	.4743	8.62	3.92	21.66	1.47	16.46	10.68	4.5	6.0	5.5	48.3

PREDICTED ION CONCENTRATIONS, ESP, SAR, EC, AND DISSOLVED CATIONS OF THE SOIL PROFILE FOR TREATMENT NO. 02 (WATER TABLE DEPTH 1000 MM; WATER TABLE EC 2 DS/M; SANDY LOAM SOIL; COTTON CROP; 14 DAYS IRRIGATION INTERVAL WITH IRRIGATION APPLICATION AMOUNT AS 0.50 OF ET)

End of Year	Depth (mm)	Theta (cm3/cm3)	Ca	Mg	Na	K	Cl	SO4	ESP	SAR	EC (ds/m)	Diss. Cat. (meq/l)
			mmol/l									
1	50	.3150	.39	.20	5.86	.39	2.47	2.02	4.0	6.1	.8	7.4
	150	.3216	.80	.33	8.24	.47	3.65	3.12	4.4	6.4	1.2	11.2
	250	.3291	1.43	.61	11.63	.61	5.44	5.03	4.8	6.7	1.9	17.3
	350	.3373	2.23	.91	14.43	.77	7.11	6.76	4.9	6.8	2.4	22.5
	450	.3465	2.79	1.15	16.11	.86	8.23	7.95	5.1	6.9	2.8	25.8
	550	.3573	3.32	1.40	17.87	.96	9.38	8.93	5.2	7.1	3.1	28.6
	650	.3711	5.06	2.15	22.01	1.23	12.57	11.12	5.4	7.2	4.0	37.6
	750	.3899	9.18	3.87	29.40	1.69	19.25	15.23	5.6	7.3	6.1	57.3
	850	.4196	12.92	5.46	32.86	2.08	24.27	17.60	5.5	7.2	7.8	71.7
	950	.4742	9.50	4.21	21.26	1.57	17.05	11.76	4.3	5.7	5.7	50.3
2	50	.3221	.13	.07	2.80	.20	1.20	.73	3.5	5.7	.4	3.3
	150	.3273	.20	.07	4.33	.27	1.83	1.22	4.0	6.4	.6	5.2
	250	.3333	.48	.21	6.75	.41	2.89	2.20	4.5	7.0	1.0	8.5
	350	.3403	.98	.42	10.05	.56	4.57	3.66	4.9	7.1	1.5	13.4
	450	.3487	2.02	.86	14.19	.79	7.06	5.76	5.1	7.1	2.2	20.6
	550	.3590	3.78	1.56	19.29	1.04	10.83	8.68	5.3	7.2	3.3	31.0
	650	.3722	6.38	2.77	25.76	1.38	16.61	12.61	5.7	7.5	4.8	45.4
	750	.3905	9.36	4.52	33.32	1.78	23.88	17.02	6.2	8.1	6.6	62.9
	850	.4198	13.88	6.33	35.91	2.17	28.45	21.08	5.9	7.5	8.4	78.4
	950	.4742	14.50	6.76	33.02	1.86	29.10	19.20	5.6	7.1	8.4	77.5
3	50	.3301	.34	.14	4.43	.34	2.11	1.30	3.3	5.2	.7	5.7
	150	.3356	.62	.28	6.66	.42	3.19	2.15	3.9	5.9	1.0	8.9
	250	.3412	1.20	.49	10.08	.63	5.01	3.60	4.4	6.6	1.6	14.1
	350	.3471	2.29	.93	14.49	.86	7.82	5.74	4.8	6.8	2.4	21.9
	450	.3539	4.24	1.75	19.96	1.10	12.14	8.99	5.2	6.9	3.6	33.1
	550	.3625	6.67	2.92	26.96	1.42	19.02	13.33	5.8	7.5	5.1	48.2
	650	.3741	10.59	5.02	36.17	1.86	28.37	17.85	6.2	8.0	7.3	69.3
	750	.3913	13.50	6.95	42.85	2.26	35.41	20.45	6.5	8.5	9.1	85.9
	850	.4201	15.02	7.46	39.15	2.34	33.42	20.40	6.0	7.6	9.2	86.5
	950	.4743	13.33	6.47	29.20	1.76	26.95	15.97	5.0	6.5	7.7	70.5

PREDICTED ION CONCENTRATIONS, ESP, SAR, EC, AND DISSOLVED CATIONS OF THE SOIL PROFILE
FOR TREATMENT NO. 03 (WATER TABLE DEPTH 1000 MM; WATER TABLE EC 2 DS/M; SANDY LOAM SOIL;
COTTON CROP; 04 DAYS IRRIGATION INTERVAL WITH IRRIGATION APPLICATION AMOUNT AS 0.75 OF ET)

End of Year	Depth (mm)	Theta (cm3/cm3)	Ca	Mg	Na	K	Cl	SO4	ESP	SAR	EC (ds/m)	Diss. Cat. (meq/l)
			mmol/l									
1	50	.3345	.14	.07	3.59	.28	1.52	.97	3.7	6.0	.5	4.3
	150	.3403	.56	.21	7.66	.42	3.30	2.46	4.8	7.2	1.1	9.6
	250	.3457	1.93	.79	14.43	.79	6.93	5.93	5.4	7.4	2.4	22.4
	350	.3506	3.04	1.30	18.83	.94	10.58	9.85	5.7	7.6	3.6	33.5
	450	.3559	3.97	1.69	19.85	1.03	11.25	10.88	5.4	7.1	3.8	35.3
	550	.3632	3.68	1.50	18.84	1.05	10.13	9.83	5.3	7.2	3.3	31.0
	650	.3743	3.71	1.55	19.26	1.08	10.29	9.67	5.4	7.3	3.3	30.9
	750	.3913	5.26	2.18	22.64	1.29	13.02	10.91	5.6	7.5	4.2	38.7
	850	.4201	7.29	3.04	24.82	1.56	15.88	11.89	5.4	7.2	5.2	47.0
	950	.4743	7.06	3.04	18.91	1.47	13.82	9.70	4.3	5.9	4.7	40.8
2	50	.3400	.14	.07	2.74	.21	1.26	.63	3.0	4.8	.4	3.4
	150	.3449	.36	.14	5.56	.36	2.42	1.57	4.3	6.8	.8	6.8
	250	.3483	1.08	.43	11.15	.58	5.18	3.81	5.3	7.6	1.7	15.1
	350	.3514	2.54	1.09	18.66	.87	9.80	7.84	6.1	8.3	3.1	28.8
	450	.3558	4.26	1.84	24.11	1.10	14.41	12.20	6.3	8.4	4.5	41.8
	550	.3629	6.37	2.70	27.14	1.35	17.32	14.77	6.0	7.8	5.2	49.5
	650	.3741	8.12	3.40	28.60	1.55	18.86	15.54	5.7	7.4	5.6	53.1
	750	.3912	9.62	4.04	28.94	1.70	19.96	15.44	5.4	7.0	6.3	57.9
	850	.4200	10.59	4.51	27.16	1.91	20.22	14.67	4.9	6.5	6.6	59.3
	950	.4743	11.27	5.00	24.40	1.76	19.99	14.01	4.6	6.0	6.5	58.8
3	50	.3503	.58	.29	4.05	.36	2.24	1.30	2.8	4.3	.9	6.0
	150	.3505	1.01	.43	8.26	.58	4.27	2.75	4.1	6.2	1.4	11.6
	250	.3458	2.21	.93	15.22	.86	8.29	6.00	5.2	7.4	2.5	22.4
	350	.3445	4.20	1.85	23.42	1.14	13.67	10.53	6.1	8.0	4.0	37.4
	450	.3498	6.36	2.82	29.78	1.37	19.01	15.03	6.4	8.3	5.4	51.7
	550	.3592	8.98	3.86	33.40	1.56	23.75	18.48	6.3	8.0	6.5	63.0
	650	.3722	10.61	4.84	35.76	1.77	27.45	20.22	6.2	8.0	7.3	70.2
	750	.3905	12.99	5.81	35.50	2.02	28.40	19.85	5.7	7.3	8.0	75.1
	850	.4198	12.58	5.46	29.49	1.99	24.11	16.31	4.9	6.4	7.4	67.7
	950	.4742	10.58	4.70	21.36	1.57	18.62	12.44	4.1	5.4	6.0	53.6

PREDICTED ION CONCENTRATIONS, ESP, SAR, EC, AND DISSOLVED CATIONS OF THE SOIL PROFILE FOR TREATMENT NO. 04 (WATER TABLE DEPTH 1000 MM; WATER TABLE EC 2 DS/M; SANDY LOAM SOIL; COTTON CROP; 04 DAYS IRRIGATION INTERVAL WITH IRRIGATION APPLICATION AMOUNT AS 0.50 OF ET)

End of Year	Depth (mm)	Theta (cm3/cm3)	Ca	Mg	Na	K	Cl	SO4	ESP	SAR	EC (ds/m)	Diss. Cat. (meq/l)
			mmol/l									
1	50	.3289	.61	.27	7.14	.41	3.26	2.58	4.2	6.3	1.1	9.7
	150	.3342	1.86	.83	14.16	.76	7.25	6.42	5.2	7.2	2.5	23.5
	250	.3395	2.74	1.19	17.40	.84	10.52	9.89	5.6	7.4	3.6	33.6
	350	.3452	3.42	1.43	17.76	.93	9.91	9.63	5.1	6.8	3.3	31.0
	450	.3519	2.84	1.16	16.43	.87	8.43	8.29	5.1	6.9	2.8	25.9
	550	.3608	3.21	1.34	17.52	.97	9.17	8.65	5.2	7.1	3.0	27.5
	650	.3731	5.32	2.24	22.51	1.23	13.03	11.02	5.4	7.2	4.2	38.9
	750	.3908	9.12	3.79	29.15	1.70	19.22	14.29	5.6	7.3	6.2	56.7
	850	.4199	11.28	4.77	29.15	2.00	21.52	14.75	5.1	6.8	7.0	63.4
	950	.4742	8.92	3.92	18.91	1.57	15.68	10.39	3.9	5.2	5.3	46.1
2	50	.3218	.66	.33	6.78	.47	3.26	2.46	3.7	5.5	1.0	9.2
	150	.3269	1.96	.88	14.32	.74	7.16	5.81	5.0	7.0	2.4	22.0
	250	.3329	3.92	1.72	21.94	1.03	12.86	10.94	5.8	7.6	4.0	37.5
	350	.3399	6.25	2.67	26.19	1.26	16.71	14.47	5.7	7.4	5.0	48.1
	450	.3483	7.99	3.31	27.85	1.44	18.35	15.40	5.5	7.1	5.4	51.8
	550	.3586	9.85	4.15	30.30	1.63	20.75	16.08	5.4	7.0	6.4	59.9
	650	.3719	12.45	5.23	33.35	1.92	24.74	17.37	5.4	7.0	7.6	70.6
	750	.3904	14.28	6.29	34.20	2.18	27.26	18.07	5.2	6.8	8.3	77.6
	850	.4198	14.31	6.24	29.49	2.17	25.50	16.22	4.7	6.1	7.9	72.9
	950	.4742	13.52	6.07	23.61	1.76	22.34	14.11	4.1	5.3	7.1	64.6
3	50	.3416	2.12	.92	11.93	.71	7.55	5.65	4.2	5.7	2.4	20.5
	150	.3409	4.23	1.90	21.20	1.13	13.24	10.42	5.4	7.3	4.0	36.7
	250	.3389	7.00	3.08	29.41	1.40	19.68	15.68	6.0	7.8	5.6	53.4
	350	.3419	9.04	3.89	32.71	1.55	23.59	18.37	6.0	7.6	6.5	62.4
	450	.3490	9.95	4.47	34.61	1.66	26.75	19.11	6.1	7.7	7.0	67.2
	550	.3590	12.09	5.49	36.94	1.85	31.23	18.54	5.9	7.6	7.8	73.8
	650	.3722	13.84	6.61	39.37	2.15	35.37	17.99	5.8	7.6	8.7	82.4
	750	.3904	14.60	7.42	37.83	2.34	34.93	18.55	5.6	7.3	8.9	84.3
	850	.4198	9.02	4.77	27.50	1.82	27.50	17.09	5.4	6.9	7.0	64.4
	950	.4742	10.78	5.00	20.18	1.47	20.08	12.25	3.8	5.0	6.0	53.1

PREDICTED ION CONCENTRATIONS, ESP, SAR, EC, AND DISSOLVED CATIONS OF THE SOIL PROFILE FOR TREATMENT NO. 05 (WATER TABLE DEPTH 1000 MM; WATER TABLE EC 2 DS/M; SANDY LOAM SOIL; WHEAT CROP; 14 DAYS IRRIGATION INTERVAL WITH IRRIGATION APPLICATION AMOUNT AS 0.75 OF ET)

End of Year	Depth (mm)	Theta (cm3/cm3)	Ca	Mg	Na	K	Cl	SO4	ESP	SAR	EC (ds/m)	Diss. Cat. (meq/l)
			mmol/l									
1	50	.3516	.07	.00	1.82	.15	.80	.36	3.8	6.4	.3	2.1
	150	.3592	.07	.00	2.45	.15	1.04	.59	4.6	7.7	.3	2.8
	250	.3656	.08	.08	3.55	.23	1.44	.98	5.0	8.3	.5	4.0
	350	.3709	.23	.08	5.06	.31	2.07	1.61	5.2	8.3	.7	5.9
	450	.3755	.39	.16	7.14	.39	2.95	2.48	5.4	8.1	1.0	8.7
	550	.3801	.86	.31	9.74	.55	4.24	3.77	5.4	8.0	1.5	12.6
	650	.3863	1.68	.72	13.41	.72	6.31	5.75	5.5	7.8	2.2	18.9
	750	.3973	3.61	1.48	19.13	1.07	10.10	8.87	5.7	7.7	3.5	30.4
	850	.4220	6.98	2.96	26.16	1.57	15.96	13.17	5.9	7.8	5.5	47.6
	950	.4749	8.44	3.73	25.31	1.57	17.17	13.44	5.2	6.9	5.7	51.2
2	50	.3517	.07	.00	1.60	.15	.73	.29	3.0	5.1	.2	1.9
	150	.3593	.07	.00	2.00	.15	.82	.37	4.2	7.1	.3	2.2
	250	.3657	.08	.00	2.57	.15	1.06	.53	4.8	8.2	.3	2.9
	350	.3710	.08	.00	3.37	.23	1.38	.77	5.1	8.5	.5	3.8
	450	.3756	.16	.08	4.58	.23	1.86	1.16	5.1	8.4	.6	5.3
	550	.3803	.39	.16	6.52	.39	2.83	1.96	5.2	8.0	1.0	8.0
	650	.3864	1.04	.48	10.14	.64	4.71	3.43	5.1	7.6	1.7	13.7
	750	.3974	2.96	1.23	16.26	.99	8.70	6.49	5.3	7.3	3.2	25.6
	850	.4221	6.37	2.79	23.90	1.48	14.83	10.81	5.6	7.4	5.4	43.8
	950	.4749	8.44	3.83	25.02	1.57	17.37	12.36	5.1	6.8	5.8	51.0
3	50	.3518	.07	.00	1.45	.15	.65	.29	2.4	4.0	.2	1.8
	150	.3593	.07	.00	1.86	.15	.82	.37	3.7	6.3	.3	2.2
	250	.3657	.08	.00	2.34	.15	.98	.45	4.6	7.9	.3	2.6
	350	.3710	.08	.00	2.99	.15	1.23	.61	5.0	8.4	.4	3.4
	450	.3757	.16	.08	3.88	.23	1.63	.85	5.0	8.2	.5	4.5
	550	.3804	.31	.16	5.50	.31	2.36	1.41	4.8	7.7	.8	6.7
	650	.3865	.80	.32	8.62	.56	4.07	2.56	4.7	7.1	1.4	11.5
	750	.3974	2.46	1.07	14.04	.90	7.64	5.01	4.8	6.8	2.7	22.1
	850	.4221	5.58	2.53	21.19	1.40	13.34	8.81	5.1	7.1	4.7	38.9
	950	.4749	7.85	3.63	23.06	1.47	16.29	10.70	4.9	6.6	5.5	47.5

PREDICTED ION CONCENTRATIONS, ESP, SAR, EC, AND DISSOLVED CATIONS OF THE SOIL PROFILE FOR TREATMENT NO. 06 (WATER TABLE DEPTH 1000 MM; WATER TABLE EC 2 DS/M; SANDY LOAM SOIL; WHEAT CROP; 14 DAYS IRRIGATION INTERVAL WITH IRRIGATION APPLICATION AMOUNT AS 0.50 OF ET)

End of Year	Depth (mm)	Theta (cm3/cm3)	Ca	Mg	Na	K	Cl	SO4	ESP	SAR	EC (ds/m)	Diss. Cat. (meq/l)
			mmol/l									
1	50	.3486	.14	.07	3.17	.22	1.30	.86	4.1	6.7	.4	3.7
	150	.3555	.22	.07	5.14	.29	2.13	1.69	4.7	7.4	.7	6.2
	250	.3611	.60	.22	7.98	.45	3.43	2.91	5.1	7.6	1.1	10.1
	350	.3654	1.13	.45	11.17	.60	4.98	4.61	5.3	7.6	1.7	15.0
	450	.3692	1.83	.76	14.04	.76	6.64	6.33	5.3	7.6	2.2	20.1
	550	.3738	2.70	1.16	16.76	.93	8.34	8.03	5.5	7.5	2.8	25.3
	650	.3810	4.41	1.81	21.10	1.18	11.49	10.55	5.6	7.5	3.8	34.7
	750	.3944	8.15	3.42	28.68	1.55	17.93	14.83	5.8	7.6	5.8	53.5
	850	.4210	12.87	5.48	34.53	2.09	24.70	18.70	5.8	7.6	8.0	73.2
	950	.4746	11.57	5.10	26.08	1.77	20.69	14.81	4.8	6.3	6.8	61.3
2	50	.3488	.14	.07	2.81	.22	1.23	.72	3.6	6.0	.4	3.4
	150	.3558	.22	.07	4.63	.29	1.98	1.32	4.3	6.9	.7	5.6
	250	.3615	.52	.22	7.39	.45	3.21	2.39	4.9	7.5	1.1	9.3
	350	.3659	1.13	.45	10.96	.60	5.07	4.08	5.2	7.6	1.7	14.7
	450	.3698	2.22	.92	15.20	.84	7.56	6.27	5.3	7.5	2.5	22.4
	550	.3743	4.18	1.70	20.34	1.08	11.29	9.28	5.5	7.4	3.7	33.3
	650	.3814	7.41	3.07	27.27	1.50	17.42	13.48	5.8	7.5	5.5	49.7
	750	.3946	11.50	5.22	36.04	1.96	26.42	18.18	6.2	8.0	7.8	71.4
	850	.4211	15.14	7.22	40.28	2.35	33.06	19.92	6.2	7.9	9.4	87.4
	950	.4746	13.83	6.47	30.50	1.86	26.97	16.08	5.0	6.5	7.7	73.0
3	50	.3489	.14	.07	2.81	.22	1.23	.72	3.2	5.3	.4	3.4
	150	.3560	.29	.15	4.71	.29	2.06	1.32	4.0	6.4	.7	5.8
	250	.3616	.60	.30	7.70	.45	3.51	2.39	4.6	7.0	1.2	10.0
	350	.3661	1.44	.61	11.72	.68	5.82	4.16	5.0	7.3	1.9	16.5
	450	.3701	2.83	1.22	16.75	.92	9.10	6.73	5.3	7.3	3.0	25.8
	550	.3746	5.11	2.17	22.83	1.24	14.16	10.37	5.6	7.5	4.3	38.6
	650	.3816	7.88	3.78	31.30	1.66	21.92	15.06	6.3	8.3	6.1	56.1
	750	.3947	12.80	6.12	40.04	2.12	32.05	20.06	6.4	8.3	8.7	80.0
	850	.4211	15.57	8.09	43.94	2.44	38.46	20.45	6.5	8.4	10.0	93.5
	950	.4746	14.51	7.06	33.54	1.86	31.18	16.57	5.3	6.9	8.2	78.5

PREDICTED ION CONCENTRATIONS, ESP, SAR, EC, AND DISSOLVED CATIONS OF THE SOIL PROFILE FOR TREATMENT NO. 07 (WATER TABLE DEPTH 1000 MM; WATER TABLE EC 2 DS/M; SANDY LOAM SOIL; WHEAT CROP; 04 DAYS IRRIGATION INTERVAL WITH IRRIGATION APPLICATION AMOUNT AS 0.75 OF ET)

End of Year	Depth (mm)	Theta (cm3/cm3)	Ca	Mg	Na	K	Cl	SO4	ESP	SAR	EC (ds/m)	Diss. Cat. (meq/l)
			mmol/l									
1	50	.3371	.14	.07	2.86	.21	1.25	.70	3.6	5.8	.4	3.4
	150	.3425	.28	.14	5.66	.35	2.41	1.63	4.7	7.4	.8	6.9
	250	.3467	1.07	.43	10.89	.57	4.94	4.01	5.2	7.5	1.6	14.5
	350	.3504	2.68	1.09	16.87	.87	8.47	7.67	5.4	7.5	2.8	25.3
	450	.3552	3.82	1.61	19.67	1.03	10.35	9.98	5.4	7.3	3.4	31.5
	550	.3626	3.75	1.57	19.33	1.05	10.19	10.04	5.4	7.3	3.3	31.2
	650	.3740	3.86	1.62	19.63	1.08	10.43	10.05	5.5	7.4	3.4	31.5
	750	.3912	5.17	2.18	22.87	1.29	12.93	11.48	5.7	7.6	4.2	38.7
	850	.4200	7.20	3.04	26.12	1.56	16.31	12.84	5.7	7.6	5.3	48.2
	950	.4743	7.35	3.14	20.38	1.57	14.60	10.58	4.6	6.2	4.9	42.9
2	50	.3393	.14	.07	2.73	.21	1.26	.63	2.9	4.8	.4	3.4
	150	.3451	.36	.14	5.78	.36	2.57	1.64	4.3	6.8	.8	7.1
	250	.3496	1.23	.51	11.70	.65	5.56	4.12	5.2	7.7	1.8	15.9
	350	.3535	3.21	1.39	19.65	1.02	10.23	8.33	5.8	7.9	3.3	29.8
	450	.3580	5.47	2.29	25.22	1.26	14.20	12.28	5.8	7.8	4.5	42.1
	550	.3647	6.86	2.86	27.28	1.36	16.13	14.09	5.8	7.6	5.1	48.1
	650	.3752	7.83	3.26	28.30	1.47	17.44	14.65	5.7	7.4	5.6	51.9
	750	.3917	9.55	3.97	29.54	1.70	19.67	15.30	5.6	7.2	6.3	58.4
	850	.4202	11.20	4.78	29.00	1.91	21.27	15.37	5.2	6.8	6.9	62.9
	950	.4743	10.39	4.61	22.64	1.67	18.42	12.64	4.3	5.7	6.0	54.3
3	50	.3411	.21	.07	2.68	.28	1.27	.70	2.5	4.2	.4	3.5
	150	.3471	.43	.22	5.88	.43	2.73	1.65	4.0	6.2	.9	7.5
	250	.3519	1.53	.65	12.65	.73	6.18	4.36	5.1	7.4	2.0	17.7
	350	.3559	4.12	1.76	22.57	1.10	12.21	9.27	5.9	8.0	3.9	35.4
	450	.3603	7.52	3.20	30.89	1.49	18.31	14.52	6.3	8.2	5.8	53.7
	550	.3665	10.07	4.24	34.53	1.67	21.96	17.57	6.1	8.0	6.9	64.9
	650	.3762	11.81	4.97	34.98	1.87	23.78	18.50	5.8	7.5	7.5	70.4
	750	.3922	13.53	5.75	34.44	2.03	25.36	18.72	5.5	7.0	8.1	75.0
	850	.4203	14.33	6.17	31.96	2.17	25.44	17.80	5.1	6.6	8.1	75.0
	950	.4744	12.74	5.68	24.80	1.76	21.56	14.60	4.3	5.6	6.9	63.5

PREDICTED ION CONCENTRATIONS, ESP, SAR, EC, AND DISSOLVED CATIONS OF THE SOIL PROFILE
FOR TREATMENT NO. 08 (WATER TABLE DEPTH 1000 MM; WATER TABLE EC 2 DS/M; SANDY LOAM SOIL;
WHEAT CROP; 04 DAYS IRRIGATION INTERVAL WITH IRRIGATION APPLICATION AMOUNT AS 0.50 OF ET)

End of Year	Depth (mm)	Theta (cm3/cm3)	Ca	Mg	Na	K	Cl	SO4	ESP	SAR	EC (ds/m)	Diss. Cat. (meq/l)
			mmol/l									
1	50	.3397	.28	.14	4.98	.35	2.18	1.54	3.9	6.2	.7	6.2
	150	.3453	1.00	.43	10.13	.57	4.64	3.78	4.9	7.3	1.5	13.5
	250	.3495	2.46	1.01	15.81	.87	7.87	7.22	5.3	7.3	2.6	23.5
	350	.3528	3.21	1.38	17.86	.95	9.18	8.97	5.2	7.1	3.1	28.3
	450	.3569	3.10	1.33	17.33	.96	8.85	8.78	5.2	7.1	2.9	27.2
	550	.3637	3.46	1.43	18.26	.98	9.54	9.24	5.3	7.2	3.1	29.0
	650	.3745	5.49	2.24	23.21	1.24	13.31	11.84	5.5	7.4	4.3	39.9
	750	.3914	9.30	3.88	30.57	1.70	19.89	15.45	5.8	7.6	6.4	58.8
	850	.4201	11.89	5.03	31.68	2.00	22.91	16.14	5.5	7.2	7.4	67.6
	950	.4743	9.02	4.02	19.80	1.67	16.17	10.78	4.0	5.4	5.4	47.5
2	50	.3404	.49	.21	5.63	.42	2.67	1.83	3.7	5.6	.9	7.5
	150	.3461	1.64	.72	12.73	.72	6.22	4.93	4.9	7.0	2.0	18.2
	250	.3503	4.20	1.74	21.21	1.09	11.51	9.84	5.6	7.5	3.7	34.2
	350	.3537	6.21	2.56	25.58	1.32	14.83	13.15	5.6	7.4	4.8	44.4
	450	.3578	7.32	3.03	27.06	1.40	16.49	14.19	5.5	7.2	5.2	49.2
	550	.3643	9.18	3.84	30.03	1.58	19.57	15.66	5.6	7.2	6.2	57.7
	650	.3748	11.62	4.88	33.61	1.86	24.70	18.12	5.7	7.3	7.3	68.4
	750	.3915	11.41	5.50	35.43	1.94	29.36	19.74	6.1	7.8	7.5	71.2
	850	.4201	15.45	6.77	32.38	2.26	27.86	17.88	4.9	6.4	8.5	79.0
	950	.4743	10.88	4.90	20.19	1.57	18.33	11.66	3.8	5.0	5.9	53.3
3	50	.3407	.84	.35	6.69	.49	3.38	2.32	3.4	5.2	1.1	9.6
	150	.3464	2.86	1.22	16.10	.93	8.73	6.66	4.9	6.8	2.8	25.1
	250	.3507	7.17	2.97	28.33	1.45	17.39	13.84	5.8	7.5	5.3	50.1
	350	.3541	9.73	4.17	34.46	1.61	23.85	18.95	6.2	7.9	6.6	64.0
	450	.3581	8.51	3.92	33.89	1.55	26.64	20.42	6.6	8.3	7.3	69.8
	550	.3645	9.49	4.37	34.94	1.66	29.30	20.94	6.4	8.1	7.7	73.6
	650	.3750	11.70	5.89	38.35	1.94	32.93	21.15	6.3	8.1	8.1	77.6
	750	.3916	14.56	7.20	38.35	2.35	35.03	18.69	5.7	7.4	8.9	84.2
	850	.4201	16.14	7.55	33.24	2.34	30.47	18.57	4.9	6.3	8.8	82.9
	950	.4743	11.17	5.19	20.38	1.57	19.60	12.05	3.8	5.0	6.1	54.8

PREDICTED ION CONCENTRATIONS, ESP, SAR, EC, AND DISSOLVED CATIONS OF THE SOIL PROFILE FOR TREATMENT NO. 09 (WATER TABLE DEPTH 1000 MM; WATER TABLE EC 2 DS/M; CLAY LOAM SOIL; COTTON CROP; 14 DAYS IRRIGATION INTERVAL WITH IRRIGATION APPLICATION AMOUNT AS 0.75 OF ET)

End of Year	Depth (mm)	Theta (cm3/cm3)	Ca	Mg	Na	K	Cl	SO4	ESP	SAR	EC (ds/m)	Diss. Cat. (meq/l)
			mmol/l									
1	50	.3815	.08	.00	2.44	.16	1.02	.55	4.4	7.5	.3	2.8
	150	.3860	.08	.08	3.35	.24	1.36	.88	4.9	8.1	.5	3.8
	250	.3912	.16	.08	4.77	.24	1.94	1.45	5.3	8.5	.6	5.6
	350	.3971	.33	.16	6.73	.41	2.79	2.30	5.5	8.5	.9	8.2
	450	.4041	.75	.33	9.43	.50	4.01	3.59	5.6	8.4	1.4	12.0
	550	.4127	1.45	.60	12.96	.77	5.97	5.37	5.8	8.4	2.0	17.9
	650	.4237	2.89	1.23	17.77	1.05	9.02	7.97	6.0	8.2	3.0	27.1
	750	.4386	5.17	2.17	23.11	1.36	13.14	11.15	6.0	8.1	4.3	39.2
	850	.4619	7.25	3.05	25.10	1.62	15.84	12.79	5.7	7.6	5.3	47.2
	950	.4820	7.37	3.29	20.81	1.39	14.64	11.25	4.8	6.4	5.0	43.5
2	50	.3829	.08	.00	1.66	.16	.71	.32	3.4	5.7	.2	2.0
	150	.3872	.00	.00	2.00	.16	.80	.40	4.3	7.4	.3	2.2
	250	.3923	.08	.00	2.35	.16	.97	.49	4.9	8.4	.3	2.7
	350	.3981	.08	.00	3.13	.16	1.32	.74	5.2	8.6	.4	3.5
	450	.4051	.17	.08	4.52	.25	1.84	1.17	5.2	8.5	.6	5.3
	550	.4135	.43	.17	6.92	.43	2.99	2.05	5.1	7.9	1.0	8.6
	650	.4242	1.14	.53	10.43	.70	5.00	3.51	5.1	7.5	1.7	14.5
	750	.4389	2.45	1.00	14.60	1.00	7.71	5.44	5.3	7.5	2.6	22.5
	850	.4621	3.91	1.72	17.66	1.24	10.31	7.26	5.2	7.3	3.5	30.1
	950	.4820	5.08	2.29	17.83	1.10	11.55	7.97	4.8	6.5	4.0	33.8
3	50	.3840	.08	.08	1.90	.16	.87	.40	2.8	4.7	.3	2.4
	150	.3884	.08	.00	2.41	.16	1.04	.48	3.9	6.7	.3	2.8
	250	.3933	.08	.00	3.01	.16	1.30	.65	4.7	7.9	.4	3.5
	350	.3991	.16	.08	4.12	.25	1.73	.99	4.9	8.1	.6	4.9
	450	.4058	.42	.17	6.29	.42	2.77	1.68	4.8	7.5	.9	7.9
	550	.4140	1.28	.51	9.92	.68	4.96	3.08	4.5	6.8	1.7	14.1
	650	.4245	2.98	1.32	14.65	1.05	8.42	5.35	4.6	6.7	2.8	24.2
	750	.4391	5.08	2.18	18.96	1.36	11.98	7.71	4.8	6.7	4.1	34.9
	850	.4622	6.59	2.96	20.05	1.53	13.94	8.88	4.7	6.3	4.7	40.6
	950	.4820	7.17	3.39	17.83	1.29	13.74	8.76	4.1	5.5	4.6	40.1

PREDICTED ION CONCENTRATIONS, ESP, SAR, EC, AND DISSOLVED CATIONS OF THE SOIL PROFILE FOR TREATMENT NO. 10 (WATER TABLE DEPTH 1000 MM; WATER TABLE EC 2 DS/M; CLAY LOAM SOIL; COTTON CROP; 14 DAYS IRRIGATION INTERVAL WITH IRRIGATION APPLICATION AMOUNT AS 0.50 OF ET)

End of Year	Depth (mm)	Theta (cm3/cm3)	Ca	Mg	Na	K	Cl	SO4	ESP	SAR	EC (ds/m)	Diss. Cat. (meq/l)
			mmol/l									
1	50	.3812	.55	.24	7.09	.47	2.84	2.36	4.7	7.2	1.0	9.1
	150	.3858	.80	.32	9.57	.56	3.99	3.51	5.3	7.8	1.5	13.2
	250	.3910	1.45	.57	12.52	.73	5.57	5.17	5.6	7.9	2.0	18.6
	350	.3970	2.05	.90	15.17	.82	7.22	6.81	5.7	8.0	2.6	23.5
	450	.4041	2.92	1.25	17.87	1.00	9.10	8.52	5.8	7.9	3.1	28.5
	550	.4127	4.43	1.88	21.74	1.19	12.02	10.74	6.0	8.0	3.8	35.6
	650	.4237	7.18	2.98	27.23	1.58	16.63	13.83	6.0	8.0	5.3	49.2
	750	.4386	10.42	4.44	31.35	1.90	21.39	16.49	6.0	7.8	6.8	63.0
	850	.4619	10.69	4.58	27.68	1.91	20.42	14.79	5.2	7.0	6.7	60.1
	950	.4820	7.97	3.59	18.12	1.39	14.54	10.06	4.0	5.4	4.9	42.7
2	50	.3829	.16	.08	3.48	.24	1.50	.95	4.1	6.6	.5	4.2
	150	.3872	.32	.16	5.28	.32	2.24	1.52	4.6	7.4	.7	6.4
	250	.3923	.57	.24	7.86	.49	3.40	2.59	5.1	7.8	1.1	10.0
	350	.3981	1.23	.49	11.35	.66	5.26	4.11	5.3	7.8	1.7	15.5
	450	.4051	2.43	1.00	15.82	.92	8.20	6.44	5.5	7.8	2.6	23.6
	550	.4135	4.44	1.88	21.27	1.20	12.47	9.74	5.8	7.9	3.8	35.1
	650	.4242	6.92	3.07	27.52	1.58	17.88	13.58	6.1	8.2	5.3	49.1
	750	.4389	9.25	4.35	31.83	1.90	22.58	16.78	6.3	8.3	6.5	61.1
	850	.4621	11.17	5.06	31.22	1.91	24.25	17.57	5.8	7.5	7.1	65.5
	950	.4820	11.45	5.18	26.69	1.59	22.61	16.13	5.1	6.5	6.8	61.5
3	50	.3839	.48	.16	5.31	.40	2.54	1.67	3.8	5.9	.8	7.0
	150	.3883	.80	.32	7.62	.56	3.69	2.57	4.3	6.6	1.2	10.3
	250	.3933	1.38	.57	10.81	.73	5.53	3.90	4.8	7.0	1.8	15.5
	350	.3990	2.56	1.07	15.17	.91	8.41	6.10	5.1	7.2	2.6	23.4
	450	.4057	4.86	2.01	21.04	1.26	12.91	9.39	5.4	7.4	4.0	36.0
	550	.4140	8.21	3.59	28.65	1.63	19.42	13.86	5.8	7.7	5.9	53.9
	650	.4245	11.93	5.35	35.87	2.10	26.22	18.24	6.2	8.1	7.8	72.6
	750	.4391	14.61	6.71	38.29	2.36	29.21	20.96	6.2	7.9	8.9	83.3
	850	.4622	13.56	6.30	32.66	2.10	26.36	18.05	5.5	7.2	8.1	74.5
	950	.4820	11.65	5.48	24.40	1.49	21.31	14.24	4.5	5.9	6.7	60.3

PREDICTED ION CONCENTRATIONS, ESP, SAR, EC, AND DISSOLVED CATIONS OF THE SOIL PROFILE FOR TREATMENT NO. 11 (WATER TABLE DEPTH 1000 MM; WATER TABLE EC 2 DS/M; CLAY LOAM SOIL; COTTON CROP; 04 DAYS IRRIGATION INTERVAL WITH IRRIGATION APPLICATION AMOUNT AS 0.75 OF ET)

End of Year	Depth (mm)	Theta (cm3/cm3)	Ca	Mg	Na	K	Cl	SO4	ESP	SAR	EC (ds/m)	Diss. Cat. (meq/l)
			----	----	----	mmol/l	----	----				
1	50	.3874	.16	.08	3.84	.24	1.60	1.04	4.3	7.0	.5	4.6
	150	.3921	.41	.16	6.97	.41	3.00	2.27	5.3	8.3	1.0	8.6
	250	.3972	1.15	.49	11.74	.66	5.25	4.51	5.7	8.5	1.7	15.6
	350	.4027	2.41	1.00	16.97	.92	8.24	7.49	6.1	8.5	2.7	24.6
	450	.4089	3.72	1.52	20.95	1.10	10.81	10.14	6.3	8.4	3.5	32.5
	550	.4163	4.56	1.89	23.05	1.20	12.39	11.61	6.3	8.3	4.0	37.2
	650	.4260	5.46	2.29	24.56	1.32	13.73	12.32	6.2	8.3	4.5	41.3
	750	.4399	6.63	2.73	25.90	1.55	15.54	12.91	6.0	8.1	5.1	46.3
	850	.4627	7.46	3.15	24.19	1.63	15.87	12.14	5.4	7.3	5.3	46.9
	950	.4821	6.97	3.09	18.53	1.49	13.55	9.76	4.2	5.7	4.6	39.9
2	50	.3913	.16	.08	2.91	.24	1.29	.73	3.4	5.5	.4	3.6
	150	.3958	.25	.08	4.91	.33	2.13	1.31	4.7	7.5	.7	6.0
	250	.4002	.58	.25	8.52	.50	3.72	2.65	5.5	8.4	1.2	10.7
	350	.4049	1.51	.67	13.80	.75	6.44	5.02	5.9	8.7	2.1	18.7
	450	.4104	3.14	1.27	20.18	1.10	10.26	8.22	6.4	8.8	3.3	30.1
	550	.4172	5.43	2.24	26.03	1.38	14.48	11.81	6.5	8.7	4.7	42.8
	650	.4265	7.93	3.35	30.14	1.67	18.33	14.72	6.3	8.5	5.9	54.4
	750	.4402	10.10	4.27	31.65	1.91	21.01	16.37	6.1	7.9	6.8	62.2
	850	.4629	11.19	4.78	29.65	1.91	21.52	16.26	5.5	7.3	7.0	63.6
	950	.4821	11.06	4.88	25.30	1.69	19.92	14.74	4.8	6.3	6.6	59.0
3	50	.3995	.50	.25	4.29	.41	2.23	1.24	3.1	4.9	.8	6.1
	150	.4034	.75	.33	7.42	.58	3.67	2.33	4.4	6.7	1.3	10.2
	250	.4059	1.59	.67	12.50	.75	6.21	4.36	5.3	7.7	2.1	17.9
	350	.4082	3.37	1.43	19.48	1.10	10.46	7.67	5.9	8.2	3.5	30.3
	450	.4115	6.38	2.72	27.63	1.45	16.15	12.16	6.3	8.5	5.2	47.4
	550	.4171	10.26	4.31	35.07	1.90	22.41	16.89	6.5	8.5	7.1	66.0
	650	.4261	13.29	5.63	39.09	2.11	26.85	19.90	6.5	8.5	8.5	79.1
	750	.4398	13.72	5.91	36.89	2.18	26.53	19.17	6.2	8.0	8.5	78.3
	850	.4626	11.57	5.07	28.86	1.91	21.79	15.29	5.3	6.9	7.1	64.2
	950	.4820	9.46	4.28	20.61	1.49	16.83	11.55	4.2	5.5	5.6	49.6

PREDICTED ION CONCENTRATIONS, ESP, SAR, EC, AND DISSOLVED CATIONS OF THE SOIL PROFILE FOR TREATMENT NO. 12 (WATER TABLE DEPTH 1000 MM; WATER TABLE EC 2 DS/M; CLAY LOAM SOIL; COTTON CROP; 04 DAYS IRRIGATION INTERVAL WITH IRRIGATION APPLICATION AMOUNT AS 0.50 OF ET)

End of Year	Depth (mm)	Theta (cm3/cm3)	Ca	Mg	Na	K	Cl	SO4	ESP	SAR	EC (ds/m)	Diss. Cat. (meq/l)
			mmol/l									
1	50	.3851	.72	.32	8.04	.48	3.66	2.94	4.8	7.2	1.2	10.6
	150	.3896	1.77	.72	14.33	.80	6.76	6.04	5.7	8.1	2.2	20.2
	250	.3947	3.34	1.39	19.90	1.06	10.11	9.46	6.0	8.2	3.3	30.5
	350	.4005	4.30	1.82	21.93	1.16	11.67	11.17	6.0	8.1	3.8	35.3
	450	.4071	4.54	1.93	22.46	1.18	12.11	11.44	6.1	8.2	3.9	36.6
	550	.4150	5.32	2.23	24.27	1.29	13.55	12.00	6.1	8.2	4.4	40.6
	650	.4252	7.20	2.99	27.76	1.58	16.78	13.35	6.1	8.2	5.4	49.6
	750	.4395	9.08	3.81	29.15	1.82	19.25	13.98	5.8	7.7	6.3	56.8
	850	.4625	9.27	3.92	24.08	1.82	17.77	12.14	4.9	6.5	5.9	52.2
	950	.4820	7.67	3.39	16.23	1.39	13.54	8.86	3.6	4.9	4.6	39.7
2	50	.3829	.95	.40	8.15	.55	3.96	3.01	4.2	6.2	1.3	11.4
	150	.3872	2.00	.88	14.64	.80	7.28	5.84	5.4	7.8	2.4	21.3
	250	.3923	4.30	1.78	23.02	1.22	12.32	10.29	6.2	8.3	3.9	36.5
	350	.3981	7.40	3.13	30.43	1.56	17.85	14.89	6.5	8.6	5.6	52.9
	450	.4051	10.38	4.35	35.57	1.84	22.51	18.16	6.5	8.5	7.1	66.8
	550	.4135	12.82	5.38	38.02	2.05	25.89	19.82	6.4	8.3	8.1	76.4
	650	.4242	14.29	6.05	37.42	2.19	27.35	19.72	6.0	7.8	8.6	80.4
	750	.4389	14.51	6.17	33.28	2.27	26.30	18.05	5.4	7.0	8.3	76.9
	850	.4621	13.18	5.73	26.54	2.10	22.72	15.18	4.6	5.9	7.3	66.5
	950	.4820	11.45	5.18	20.22	1.59	18.72	12.25	3.8	5.0	6.2	55.1
3	50	.3944	3.26	1.39	14.75	.98	8.80	6.60	4.4	6.1	2.9	25.2
	150	.3979	5.34	2.30	22.94	1.32	13.98	10.69	5.6	7.6	4.4	39.5
	250	.4005	8.19	3.39	31.53	1.65	20.69	15.89	6.5	8.4	6.0	56.4
	350	.4036	10.17	4.34	37.52	1.83	27.02	20.26	7.0	9.0	7.3	69.9
	450	.4083	10.71	5.15	42.35	1.94	32.48	22.86	7.7	9.8	8.4	80.9
	550	.4152	13.13	6.35	44.01	2.23	35.94	23.08	7.2	9.3	8.8	85.0
	650	.4251	14.58	7.29	42.16	2.46	35.66	21.69	6.6	8.4	9.4	88.4
	750	.4393	15.25	6.99	35.22	2.36	30.41	19.61	5.5	7.1	8.8	82.1
	850	.4623	12.13	5.54	25.12	1.91	22.54	14.33	4.5	5.8	6.9	62.5
	950	.4820	9.66	4.48	17.43	1.29	16.53	10.46	3.5	4.6	5.3	46.9

PREDICTED ION CONCENTRATIONS, ESP, SAR, EC, AND DISSOLVED CATIONS OF THE SOIL PROFILE FOR TREATMENT NO. 13 (WATER TABLE DEPTH 1000 MM; WATER TABLE EC 2 DS/M; CLAY LOAM SOIL; WHEAT CROP; 14 DAYS IRRIGATION INTERVAL WITH IRRIGATION APPLICATION AMOUNT AS 0.75 OF ET)

End of Year	Depth (mm)	Theta (cm3/cm3)	Ca	Mg	Na	K	Cl	SO4	ESP	SAR	EC (ds/m)	Diss. Cat. (meq/l)
			mmol/l									
1	50	.3951	.00	.00	1.96	.16	.82	.41	4.2	7.2	.3	2.2
	150	.4000	.08	.00	2.56	.17	.99	.58	5.0	8.6	.3	2.8
	250	.4046	.08	.00	3.51	.17	1.42	1.00	5.4	9.0	.5	3.9
	350	.4092	.17	.08	4.90	.25	1.94	1.52	5.7	9.0	.7	5.7
	450	.4142	.34	.17	6.93	.43	2.82	2.40	5.7	8.9	1.0	8.4
	550	.4202	.78	.35	10.07	.61	4.34	3.82	5.8	8.7	1.5	12.9
	650	.4285	1.86	.80	14.61	.80	6.91	6.02	5.9	8.5	2.3	20.7
	750	.4413	3.83	1.64	20.33	1.19	10.85	9.21	6.1	8.4	3.6	32.4
	850	.4636	6.23	2.68	24.14	1.53	14.56	11.88	5.9	8.0	4.9	43.3
	950	.4822	7.37	3.29	22.02	1.39	15.04	11.76	5.0	6.7	5.1	44.6
2	50	.3951	.08	.00	1.63	.16	.73	.33	3.3	5.7	.2	2.0
	150	.4000	.00	.00	1.98	.17	.83	.41	4.5	7.9	.3	2.2
	250	.4046	.08	.00	2.51	.17	1.00	.59	5.2	8.9	.3	2.8
	350	.4092	.08	.00	3.30	.17	1.35	.76	5.3	9.0	.4	3.7
	450	.4142	.17	.09	4.62	.26	1.88	1.20	5.3	8.7	.6	5.4
	550	.4202	.43	.17	7.03	.43	3.04	2.08	5.3	8.2	1.0	8.8
	650	.4285	1.24	.53	11.07	.71	5.22	3.81	5.2	7.8	1.8	15.3
	750	.4413	2.92	1.28	16.50	1.09	8.84	6.38	5.4	7.7	3.0	26.0
	850	.4636	5.17	2.30	20.79	1.44	12.64	9.00	5.4	7.5	4.3	37.2
	950	.4822	6.68	2.99	20.12	1.30	13.85	9.66	4.8	6.5	4.7	40.7
3	50	.3951	.08	.00	1.55	.16	.73	.33	2.7	4.5	.2	1.9
	150	.4000	.08	.00	1.90	.17	.83	.33	4.0	6.9	.3	2.1
	250	.4046	.08	.00	2.34	.17	1.00	.50	4.9	8.4	.3	2.6
	350	.4092	.08	.00	2.96	.17	1.18	.59	5.1	8.5	.4	3.3
	450	.4142	.17	.09	3.94	.26	1.71	.94	4.9	8.1	.6	4.6
	550	.4202	.35	.17	5.90	.43	2.60	1.56	4.7	7.5	.9	7.5
	650	.4285	1.06	.44	9.30	.71	4.60	2.83	4.7	7.1	1.6	13.1
	750	.4413	2.55	1.09	14.13	1.00	7.84	5.01	4.8	7.0	2.7	22.6
	850	.4636	4.60	2.11	18.20	1.25	11.30	7.38	4.9	6.9	3.9	33.0
	950	.4822	6.08	2.79	18.23	1.20	12.85	8.27	4.4	6.1	4.4	37.4

PREDICTED ION CONCENTRATIONS, ESP, SAR, EC, AND DISSOLVED CATIONS OF THE SOIL PROFILE FOR TREATMENT NO. 14 (WATER TABLE DEPTH 1000 MM; WATER TABLE EC 2 DS/M; CLAY LOAM SOIL; WHEAT CROP; 14 DAYS IRRIGATION INTERVAL WITH IRRIGATION APPLICATION AMOUNT AS 0.50 OF ET)

End of Year	Depth (mm)	Theta (cm3/cm3)	Ca	Mg	Na	K	Cl	SO4	ESP	SAR	EC (ds/m)	Diss. Cat. (meq/l)
			mmol/l									
1	50	.3942	.08	.08	3.50	.24	1.47	.98	4.6	7.6	.5	4.1
	150	.3990	.25	.08	5.36	.33	2.23	1.73	5.2	8.2	.7	6.4
	250	.4036	.50	.25	7.84	.42	3.25	2.84	5.5	8.4	1.1	9.7
	350	.4083	.93	.42	10.63	.59	4.64	4.22	5.7	8.4	1.6	13.9
	450	.4134	1.62	.68	13.84	.77	6.41	5.98	5.9	8.4	2.2	19.3
	550	.4195	2.86	1.21	18.03	1.04	9.01	8.32	6.1	8.3	3.1	27.3
	650	.4281	5.22	2.21	23.79	1.33	13.27	11.59	6.2	8.3	4.5	39.9
	750	.4410	8.47	3.55	29.79	1.73	18.68	15.22	6.3	8.2	6.3	55.6
	850	.4635	10.82	4.60	30.64	2.01	21.36	16.47	5.7	7.6	7.2	63.4
	950	.4822	9.86	4.38	24.01	1.69	18.33	13.45	4.5	6.0	5.8	54.2
2	50	.3942	.08	.08	3.09	.24	1.30	.81	4.1	6.8	.4	3.6
	150	.3991	.25	.08	4.70	.33	1.98	1.40	4.8	7.6	.7	5.7
	250	.4037	.50	.17	7.09	.42	3.09	2.34	5.2	8.0	1.0	8.8
	350	.4084	.93	.42	10.21	.59	4.64	3.63	5.4	8.1	1.6	13.6
	450	.4134	1.96	.85	14.35	.85	7.00	5.64	5.6	7.9	2.3	20.8
	550	.4196	3.99	1.65	20.11	1.21	11.01	8.67	5.7	7.9	3.6	32.5
	650	.4281	7.43	3.18	27.68	1.59	16.98	13.09	6.0	8.0	5.6	50.4
	750	.4411	11.85	5.10	34.72	2.10	23.88	17.77	6.2	8.0	7.7	70.6
	850	.4635	14.36	6.32	35.24	2.20	26.72	19.34	5.8	7.6	8.6	78.9
	950	.4822	13.05	5.88	27.30	1.69	22.62	15.94	4.8	6.2	7.3	66.8
3	50	.3942	.16	.08	3.01	.24	1.30	.73	3.7	5.9	.4	3.7
	150	.3991	.25	.08	4.78	.33	2.14	1.32	4.3	6.8	.7	5.9
	250	.4037	.58	.25	7.26	.50	3.34	2.25	4.8	7.3	1.1	9.5
	350	.4084	1.27	.51	10.63	.68	5.15	3.63	5.0	7.3	1.8	14.9
	450	.4134	2.48	1.02	15.03	.94	7.94	5.81	5.2	7.4	2.7	23.1
	550	.4196	4.77	1.99	21.24	1.30	12.57	9.10	5.5	7.6	4.2	36.2
	650	.4281	8.40	3.63	29.28	1.77	19.37	13.89	6.1	8.0	6.4	55.2
	750	.4411	12.76	5.83	36.82	2.19	26.70	18.96	6.4	8.2	8.7	76.1
	850	.4635	14.94	6.80	37.44	2.20	29.50	20.40	6.0	7.8	9.1	83.3
	950	.4822	13.35	6.18	29.69	1.79	25.01	16.94	4.9	6.3	7.3	70.5

PREDICTED ION CONCENTRATIONS, ESP, SAR, EC, AND DISSOLVED CATIONS OF THE SOIL PROFILE FOR TREATMENT NO. 15 (WATER TABLE DEPTH 1000 MM; WATER TABLE EC 2 DS/M; CLAY LOAM SOIL; WHEAT CROP; 04 DAYS IRRIGATION INTERVAL WITH IRRIGATION APPLICATION AMOUNT AS 0.75 OF ET)

End of Year	Depth (mm)	Theta (cm3/cm3)	Ca	Mg	Na	K	Cl	SO4	ESP	SAR	EC (ds/m)	Diss. Cat. (meq/l)
			mmol/l									
1	50	.3891	.08	.08	3.05	.24	1.29	.80	4.0	6.6	.4	3.6
	150	.3937	.24	.08	5.37	.33	2.28	1.55	5.2	8.4	.7	6.3
	250	.3985	.66	.25	9.06	.49	3.87	3.13	5.7	8.6	1.3	11.4
	350	.4036	1.50	.67	13.76	.75	6.34	5.67	6.0	8.6	2.1	18.8
	450	.4093	2.79	1.18	18.35	1.01	9.05	8.46	6.2	8.5	3.0	27.1
	550	.4165	3.96	1.64	21.77	1.12	11.27	10.76	6.3	8.5	3.7	34.2
	650	.4261	5.19	2.20	24.47	1.32	13.47	12.41	6.3	8.5	4.4	40.6
	750	.4399	6.73	2.82	26.90	1.55	15.91	13.63	6.3	8.4	5.2	47.4
	850	.4627	7.74	3.25	25.91	1.72	16.73	13.29	5.7	7.6	5.5	49.6
	950	.4821	7.37	3.19	19.92	1.49	14.44	10.66	4.5	6.0	4.9	42.6
2	50	.3897	.16	.08	2.74	.24	1.29	.64	3.3	5.4	.4	3.5
	150	.3943	.24	.08	4.97	.33	2.20	1.38	4.7	7.6	.7	6.0
	250	.3990	.66	.25	8.66	.49	3.79	2.72	5.4	8.4	1.3	11.0
	350	.4041	1.50	.67	14.03	.75	6.60	5.18	6.0	8.7	2.1	19.1
	450	.4098	3.13	1.35	20.15	1.02	10.24	8.38	6.4	8.8	3.3	30.1
	550	.4168	5.34	2.24	25.92	1.38	14.38	11.97	6.5	8.7	4.6	42.5
	650	.4263	8.02	3.35	30.56	1.67	18.50	15.15	6.4	8.5	5.9	55.0
	750	.4400	10.64	4.45	32.91	1.91	21.91	17.18	6.2	8.1	7.1	65.0
	850	.4628	11.67	4.97	30.50	2.01	22.28	16.73	5.6	7.3	7.3	65.9
	950	.4821	10.56	4.68	23.41	1.59	18.83	13.55	4.6	6.0	6.2	55.7
3	50	.3902	.16	.08	2.66	.24	1.29	.64	2.8	4.6	.4	3.5
	150	.3948	.33	.16	4.89	.33	2.20	1.31	4.2	6.7	.7	6.2
	250	.3995	.74	.33	8.75	.58	4.04	2.72	5.1	7.8	1.3	11.4
	350	.4045	1.84	.75	14.71	.84	7.19	5.18	5.8	8.4	2.3	20.6
	450	.4101	3.81	1.61	21.95	1.19	11.69	8.73	6.3	8.6	3.8	34.0
	550	.4171	6.81	2.84	29.13	1.55	17.06	13.01	6.5	8.7	5.4	50.0
	650	.4264	10.31	4.32	34.80	1.94	22.38	17.00	6.5	8.5	7.1	66.1
	750	.4401	13.37	5.73	37.37	2.18	26.28	19.55	6.3	8.2	8.4	77.7
	850	.4629	14.35	6.22	34.43	2.20	26.40	19.03	5.7	7.5	8.4	77.8
	950	.4821	12.75	5.78	26.50	1.69	22.11	15.54	4.8	6.1	7.2	65.2

PREDICTED ION CONCENTRATIONS, ESP, SAR, EC, AND DISSOLVED CATIONS OF THE SOIL PROFILE FOR TREATMENT NO. 16 (WATER TABLE DEPTH 1000 MM; WATER TABLE EC 2 DS/M; CLAY LOAM SOIL; WHEAT CROP; 04 DAYS IRRIGATION INTERVAL WITH IRRIGATION APPLICATION AMOUNT AS 0.50 OF ET)

End of Year	Depth (mm)	Theta (cm3/cm3)	Ca	Mg	Na	K	Cl	SO4	ESP	SAR	EC (ds/m)	Diss. Cat. (meq/l)
			mmol/l									
1	50	.3908	.40	.16	5.65	.40	2.42	1.86	4.4	6.9	.8	7.0
	150	.3954	.90	.41	10.21	.57	4.49	3.84	5.5	8.2	1.5	13.3
	250	.4001	1.98	.83	15.38	.83	7.27	6.70	6.0	8.3	2.4	21.8
	350	.4050	3.18	1.34	19.25	1.00	9.62	9.29	6.1	8.3	3.2	29.3
	450	.4106	4.16	1.70	21.89	1.19	11.45	11.11	6.2	8.3	3.7	34.9
	550	.4174	5.43	2.24	24.92	1.38	13.80	12.76	6.3	8.4	4.5	41.7
	650	.4266	7.49	3.17	29.26	1.59	17.54	14.63	6.3	8.4	5.7	52.2
	750	.4402	9.64	4.09	31.56	1.82	20.55	15.55	6.2	8.1	6.7	60.8
	850	.4629	9.85	4.21	26.40	1.91	19.13	13.39	5.2	6.9	6.3	56.4
	950	.4821	7.97	3.49	17.43	1.49	14.34	9.56	3.7	5.0	4.8	42.0
2	50	.3910	.57	.24	6.30	.48	2.99	2.18	4.0	6.1	1.0	8.5
	150	.3957	1.47	.65	12.43	.74	5.97	4.74	5.3	7.7	2.0	17.5
	250	.4004	3.39	1.41	20.10	1.08	10.42	8.77	6.0	8.3	3.4	30.9
	350	.4053	5.95	2.51	27.05	1.42	15.24	12.98	6.4	8.5	4.9	45.4
	450	.4108	8.74	3.65	32.68	1.70	19.86	16.55	6.5	8.6	6.3	59.2
	550	.4176	11.82	4.92	37.27	1.98	24.50	19.24	6.6	8.5	7.8	72.7
	650	.4267	14.63	6.17	39.41	2.20	28.12	20.37	6.3	8.1	8.9	83.3
	750	.4403	15.74	6.64	36.84	2.37	28.47	19.83	5.7	7.4	9.0	84.0
	850	.4630	13.49	5.93	28.22	2.10	23.44	15.78	4.8	6.2	7.6	69.2
	950	.4821	9.86	4.48	18.23	1.49	16.44	10.76	3.6	4.8	5.4	48.3
3	50	.3911	1.05	.48	7.60	.57	3.88	2.75	3.8	5.6	1.3	11.2
	150	.3958	2.70	1.14	15.62	.98	8.34	6.22	5.2	7.2	2.7	24.2
	250	.4005	5.96	2.48	25.98	1.41	15.14	11.67	6.0	8.2	4.8	44.2
	350	.4054	9.80	4.10	35.18	1.76	22.62	17.34	6.6	8.6	6.9	64.7
	450	.4108	11.46	5.09	40.83	1.95	29.20	21.05	7.2	9.3	7.9	75.8
	550	.4176	12.86	6.04	43.83	2.16	34.08	23.30	7.3	9.4	8.7	84.0
	650	.4268	13.84	6.79	43.39	2.38	36.33	22.93	7.0	8.9	9.1	86.9
	750	.4403	15.28	7.28	39.03	2.46	34.02	21.47	6.1	7.7	9.2	86.7
	850	.4630	14.06	6.41	29.37	2.10	26.50	17.03	4.8	6.2	7.8	72.3
	950	.4821	10.46	4.78	19.03	1.49	17.93	11.55	3.6	4.7	5.6	50.9

PREDICTED ION CONCENTRATIONS, ESP, SAR, EC, AND DISSOLVED CATIONS OF THE SOIL PROFILE
FOR TREATMENT NO. 17 (WATER TABLE DEPTH 1000 MM; WATER TABLE EC 6 DS/M; SANDY LOAM SOIL;
COTTON CROP; 14 DAYS IRRIGATION INTERVAL WITH IRRIGATION APPLICATION AMOUNT AS 0.75 OF ET)

End of Year	Depth (mm)	Theta (cm3/cm3)	Ca	Mg	Na	K	Cl	SO4	ESP	SAR	EC (ds/m)	Diss. Cat. (meq/l)
			----	----	----	mmol/l	----	----				
1	50	.3205	.07	.00	2.19	.13	.93	.53	3.7	6.2	.3	2.5
	150	.3263	.07	.07	3.03	.20	1.28	.81	4.2	6.9	.4	3.5
	250	.3324	.21	.07	4.53	.27	1.85	1.37	4.5	7.3	.6	5.3
	350	.3394	.42	.14	6.52	.35	2.73	2.24	4.8	7.3	.9	8.0
	450	.3477	.72	.29	8.91	.50	3.88	3.45	5.0	7.3	1.3	11.6
	550	.3580	1.41	.59	11.91	.67	5.47	5.18	5.1	7.2	1.9	17.0
	650	.3714	2.76	1.15	16.57	.92	8.44	8.52	5.4	7.3	2.9	26.9
	750	.3901	5.96	2.66	26.60	1.29	15.15	16.28	6.3	8.1	5.1	49.7
	850	.4197	10.93	6.68	45.27	1.91	26.45	31.65	8.2	10.1	9.2	92.7
	950	.4742	12.34	9.41	51.83	1.67	31.84	37.92	9.2	11.2	11.1	110.7
2	50	.3222	.07	.00	1.53	.13	.67	.27	2.8	4.7	.2	1.8
	150	.3274	.07	.00	1.76	.14	.74	.34	3.7	6.3	.2	2.0
	250	.3334	.07	.00	2.14	.14	.90	.48	4.3	7.4	.3	2.4
	350	.3404	.07	.00	2.74	.14	1.13	.63	4.6	7.7	.4	3.1
	450	.3488	.14	.07	3.82	.22	1.59	1.08	4.6	7.6	.5	4.4
	550	.3591	.37	.15	6.16	.37	2.60	2.30	4.8	7.4	.9	7.6
	650	.3722	1.23	.54	11.69	.62	5.23	5.69	5.4	7.6	1.9	17.8
	750	.3905	3.79	2.34	23.88	1.13	10.81	14.36	6.7	8.7	4.5	43.1
	850	.4198	10.32	6.77	40.16	1.65	18.82	32.61	7.5	9.0	8.7	87.1
	950	.4742	11.46	9.90	51.53	1.47	25.87	40.95	9.3	11.1	11.0	111.4
3	50	.3312	.07	.07	1.78	.21	.82	.41	2.3	3.9	.3	2.3
	150	.3367	.07	.00	2.30	.14	.97	.49	3.5	5.8	.3	2.7
	250	.3422	.07	.07	2.97	.21	1.27	.71	4.2	7.0	.4	3.4
	350	.3480	.14	.07	4.10	.29	1.65	1.22	4.5	7.2	.6	4.8
	450	.3546	.51	.22	6.37	.44	2.71	2.56	4.4	6.7	.9	8.2
	550	.3630	1.65	.75	11.48	.68	5.63	6.15	4.7	6.5	2.1	18.6
	650	.3744	4.56	2.32	22.36	1.08	12.84	14.54	5.8	7.5	4.6	43.5
	750	.3914	8.25	6.15	42.13	1.54	25.07	29.03	8.1	10.0	8.7	86.1
	850	.4201	9.81	11.02	61.02	1.82	35.50	42.96	10.3	12.5	12.2	124.7
	950	.4743	11.37	12.64	62.91	1.37	38.71	46.06	10.7	12.6	13.2	134.5

PREDICTED ION CONCENTRATIONS, ESP, SAR, EC, AND DISSOLVED CATIONS OF THE SOIL PROFILE FOR TREATMENT NO. 18 (WATER TABLE DEPTH 1000 MM; WATER TABLE EC 6 DS/M; SANDY LOAM SOIL; COTTON CROP; 14 DAYS IRRIGATION INTERVAL WITH IRRIGATION APPLICATION AMOUNT AS 0.50 OF ET)

End of Year	Depth (mm)	Theta (cm3/cm3)	Ca	Mg	Na	K	Cl	SO4	ESP	SAR	EC (ds/m)	Diss. Cat. (meq/l)
			mmol/l									
1	50	.3150	.39	.20	5.86	.39	2.47	2.02	4.0	6.2	.8	7.4
	150	.3216	.73	.33	8.24	.47	3.65	3.19	4.4	6.4	1.2	11.2
	250	.3291	1.43	.61	11.63	.61	5.44	5.03	4.8	6.7	1.9	17.1
	350	.3373	2.23	.91	14.50	.77	7.11	6.83	4.9	6.8	2.5	22.6
	450	.3465	2.94	1.22	16.47	.93	8.45	8.38	5.1	6.9	2.9	26.9
	550	.3573	3.99	1.62	19.12	1.03	10.78	10.93	5.2	6.9	3.6	34.1
	650	.3711	6.82	2.91	26.38	1.38	18.48	18.17	5.8	7.3	5.9	56.7
	750	.3899	9.99	5.56	45.92	1.77	36.73	32.22	8.4	10.3	10.5	104.0
	850	.4196	10.23	10.40	70.66	2.17	53.32	44.56	11.7	14.6	14.4	145.8
	950	.4742	12.15	11.37	59.08	1.57	40.07	43.31	10.2	12.2	13.0	129.9
2	50	.3221	.13	.07	2.86	.20	1.26	.80	3.5	5.6	.4	3.4
	150	.3273	.20	.07	4.46	.27	1.96	1.35	4.0	6.3	.6	5.4
	250	.3333	.55	.21	7.02	.41	3.24	2.55	4.5	6.8	1.0	9.0
	350	.3403	1.20	.49	10.69	.56	5.41	4.57	4.9	7.0	1.7	15.8
	450	.3487	2.45	1.01	15.85	.79	9.15	8.14	5.3	7.3	3.0	27.3
	550	.3590	4.52	2.00	24.48	1.11	16.17	14.46	6.4	8.2	5.1	48.1
	650	.3722	6.84	4.15	40.30	1.46	29.07	25.45	8.4	10.7	8.5	83.1
	750	.3905	9.04	9.12	65.59	2.02	47.12	42.68	11.1	13.8	13.4	135.9
	850	.4198	9.28	14.57	85.35	2.17	60.63	55.51	13.4	16.3	16.9	175.4
	950	.4742	10.78	16.66	87.59	1.67	64.66	58.69	13.9	16.6	18.1	186.3
3	50	.3301	.41	.20	4.71	.34	2.46	1.71	3.3	5.0	.7	6.3
	150	.3356	.83	.35	7.28	.49	4.02	3.05	3.9	5.7	1.2	10.6
	250	.3412	1.62	.70	11.35	.70	6.91	5.57	4.4	6.3	2.1	19.0
	350	.3471	3.16	1.36	17.21	.93	11.90	9.97	5.2	6.9	3.7	33.3
	450	.3539	5.41	2.41	26.69	1.17	20.69	17.11	6.4	8.2	6.1	57.1
	550	.3625	7.56	4.57	44.04	1.50	36.18	28.24	8.7	11.0	9.8	95.5
	650	.3741	8.58	9.20	72.04	1.93	58.90	44.29	12.0	15.1	14.9	150.6
	750	.3913	8.17	16.82	103.16	2.34	78.34	62.82	15.0	18.6	19.8	207.9
	850	.4201	8.68	21.01	109.45	2.26	77.34	69.44	15.6	18.7	20.7	220.5
	950	.4743	10.68	18.82	89.27	1.47	64.09	60.46	13.8	16.3	18.3	189.3

PREDICTED ION CONCENTRATIONS, ESP, SAR, EC, AND DISSOLVED CATIONS OF THE SOIL PROFILE FOR TREATMENT NO. 19 (WATER TABLE DEPTH 1000 MM; WATER TABLE EC 6 DS/M; SANDY LOAM SOIL; COTTON CROP; 04 DAYS IRRIGATION INTERVAL WITH IRRIGATION APPLICATION AMOUNT AS 0.75 OF ET)

End of Year	Depth (mm)	Theta (cm3/cm3)	Ca	Mg	Na	K	Cl	SO4	ESP	SAR	EC (ds/m)	Diss. Cat. (meq/l)
			mmol/l									
1	50	.3345	.14	.07	3.59	.28	1.52	.97	3.7	6.1	.5	4.3
	150	.3403	.56	.21	7.59	.42	3.30	2.46	4.8	7.2	1.0	9.6
	250	.3457	1.86	.79	14.14	.71	6.93	6.00	5.4	7.4	2.4	22.4
	350	.3506	2.90	1.30	18.62	.94	10.58	9.85	5.9	7.8	3.6	33.6
	450	.3559	4.04	1.69	19.93	1.03	11.32	11.10	5.4	7.1	3.9	36.0
	550	.3632	4.13	1.73	19.81	1.05	10.66	11.18	5.3	7.1	3.7	34.3
	650	.3743	5.88	2.47	23.05	1.24	13.15	14.93	5.5	7.0	4.7	44.0
	750	.3913	10.27	4.37	32.42	1.70	22.15	24.17	6.1	7.6	7.5	72.4
	850	.4201	10.94	6.42	46.09	1.91	33.24	32.12	8.3	10.3	10.3	100.4
	950	.4743	12.35	8.33	46.55	1.67	31.75	35.57	8.3	10.1	10.8	106.2
2	50	.3400	.14	.07	2.74	.21	1.26	.70	3.0	4.8	.4	3.4
	150	.3449	.36	.14	5.63	.36	2.49	1.64	4.3	6.8	.8	6.9
	250	.3483	1.15	.50	11.37	.58	5.47	4.17	5.3	7.6	1.8	16.0
	350	.3514	2.83	1.23	19.46	.94	10.60	9.15	6.1	8.3	3.5	32.2
	450	.3558	5.29	2.35	26.61	1.25	16.98	15.66	6.4	8.2	5.4	51.1
	550	.3629	8.10	3.52	31.94	1.42	23.39	21.74	6.5	8.1	7.3	69.4
	650	.3741	10.05	4.71	39.27	1.70	30.61	26.36	7.3	9.0	8.9	86.0
	750	.3912	10.10	6.39	49.87	1.86	38.55	32.09	8.9	11.1	10.7	105.6
	850	.4200	10.33	9.37	59.62	2.00	43.91	39.74	10.2	12.6	12.7	126.7
	950	.4743	11.76	11.17	61.93	1.67	45.86	43.51	10.6	12.7	13.7	136.6
3	50	.3503	.58	.29	4.13	.36	2.39	1.45	2.8	4.2	.9	6.2
	150	.3505	1.09	.51	8.62	.58	4.78	3.33	4.1	6.0	1.5	12.4
	250	.3458	2.64	1.14	16.22	.86	9.79	7.57	5.2	7.1	3.0	26.7
	350	.3445	5.05	2.21	25.55	1.21	17.58	14.38	6.2	8.0	5.2	49.0
	450	.3498	7.52	3.47	34.40	1.45	27.68	21.97	7.0	8.8	7.7	74.2
	550	.3592	8.53	4.60	44.83	1.63	40.15	28.57	8.5	10.6	10.3	100.0
	650	.3722	9.38	6.54	58.91	1.85	53.45	34.53	10.2	12.9	12.7	125.3
	750	.3905	9.20	10.41	75.60	2.10	61.40	44.21	12.2	15.3	15.1	153.1
	850	.4198	9.63	13.70	78.24	2.08	55.60	50.05	12.3	15.1	15.5	159.2
	950	.4742	11.56	12.93	63.98	1.47	44.58	45.85	10.8	12.7	13.9	140.0

PREDICTED ION CONCENTRATIONS, ESP, SAR, EC, AND DISSOLVED CATIONS OF THE SOIL PROFILE FOR TREATMENT NO. 20 (WATER TABLE DEPTH 1000 MM; WATER TABLE EC 6 DS/M; SANDY LOAM SOIL; COTTON CROP; 04 DAYS IRRIGATION INTERVAL WITH IRRIGATION APPLICATION AMOUNT AS 0.50 OF ET)

End of Year	Depth (mm)	Theta (cm3/cm3)	Ca	Mg	Na	K	Cl	SO4	ESP	SAR	EC (ds/m)	Diss. Cat. (meq/l)
			mmol/l									
1	50	.3289	.61	.27	7.20	.48	3.26	2.58	4.2	6.3	1.1	9.6
	150	.3342	2.00	.90	14.50	.76	7.25	6.42	5.2	7.1	2.5	23.3
	250	.3395	2.74	1.19	17.47	.84	10.52	9.96	5.6	7.4	3.6	33.7
	350	.3452	3.42	1.43	17.83	1.00	9.91	9.77	5.1	6.8	3.4	31.2
	450	.3519	3.13	1.31	17.01	.95	8.80	9.02	5.1	6.9	3.0	27.7
	550	.3608	4.47	1.86	19.90	1.12	11.33	12.00	5.2	6.9	3.9	36.2
	650	.3731	8.79	3.70	29.22	1.54	21.89	20.58	5.9	7.2	6.8	64.8
	750	.3908	10.42	5.65	46.75	1.78	40.37	29.96	8.4	10.5	10.6	103.1
	850	.4199	10.24	9.72	67.06	2.17	50.93	41.82	11.2	14.0	13.7	137.8
	950	.4742	11.86	10.78	56.14	1.57	38.90	41.54	9.7	11.7	12.6	125.4
2	50	.3218	.73	.33	6.85	.47	3.46	2.59	3.7	5.5	1.1	9.8
	150	.3269	2.09	.88	14.52	.74	7.70	6.42	5.1	7.0	2.6	23.8
	250	.3329	4.26	1.86	22.56	1.10	14.65	12.86	5.8	7.6	4.6	43.2
	350	.3399	6.25	2.81	27.46	1.26	21.42	19.24	6.1	7.7	6.6	62.4
	450	.3483	7.63	3.45	31.02	1.37	28.50	24.76	6.5	7.9	8.5	80.7
	550	.3586	8.82	4.45	40.68	1.56	39.64	30.97	7.9	9.6	10.8	104.2
	650	.3719	9.07	6.61	58.94	1.77	54.48	37.19	10.4	13.1	13.4	131.9
	750	.3904	8.95	11.37	80.02	2.18	65.01	48.24	12.7	16.0	16.2	164.9
	850	.4198	9.37	15.70	86.22	2.17	63.32	55.25	13.2	16.0	17.2	177.5
	950	.4742	11.17	15.68	76.32	1.47	56.43	52.61	12.3	14.6	16.3	165.6
3	50	.3416	2.61	1.13	12.70	.78	9.39	7.34	4.1	5.5	2.9	26.1
	150	.3409	4.65	2.04	22.05	1.13	17.61	14.02	5.6	7.2	5.3	48.3
	250	.3389	7.49	3.36	31.37	1.40	28.71	22.27	6.4	8.0	8.0	75.7
	350	.3419	8.83	4.17	38.36	1.48	39.63	27.69	7.3	8.9	10.2	97.4
	450	.3490	8.73	4.90	48.38	1.59	52.42	32.30	8.9	11.1	12.4	119.8
	550	.3590	8.53	7.12	68.02	1.78	68.98	40.13	11.6	14.8	15.4	152.3
	650	.3722	8.07	12.69	94.20	2.23	84.05	54.29	14.3	18.1	19.1	196.0
	750	.3904	7.99	19.68	112.20	2.50	86.39	68.24	15.7	19.2	21.4	227.0
	850	.4198	8.76	20.90	101.65	2.17	69.56	66.87	14.7	17.3	19.6	207.6
	950	.4742	10.97	16.85	75.05	1.27	51.53	54.18	12.1	14.1	16.0	164.1

PREDICTED ION CONCENTRATIONS, ESP, SAR, EC, AND DISSOLVED CATIONS OF THE SOIL PROFILE FOR TREATMENT NO. 21 (WATER TABLE DEPTH 1000 MM; WATER TABLE EC 6 DS/M; SANDY LOAM SOIL; WHEAT CROP; 14 DAYS IRRIGATION INTERVAL WITH IRRIGATION APPLICATION AMOUNT AS 0.75 OF ET)

End of Year	Depth (mm)	Theta (cm3/cm3)	Ca	Mg	Na	K	Cl	SO4	ESP	SAR	EC (ds/m)	Diss. Cat. (meq/l)
			mmol/l									
1	50	.3516	.07	.00	1.82	.15	.80	.36	3.8	6.4	.3	2.1
	150	.3592	.07	.00	2.45	.15	1.04	.59	4.6	7.7	.3	2.8
	250	.3656	.08	.08	3.55	.23	1.44	.98	5.0	8.2	.5	4.0
	350	.3709	.23	.08	5.06	.31	2.07	1.61	5.2	8.3	.7	5.9
	450	.3755	.47	.16	7.14	.39	2.95	2.56	5.4	8.1	1.0	8.8
	550	.3801	.94	.39	10.05	.55	4.40	4.08	5.4	7.9	1.5	13.2
	650	.3863	2.15	.88	14.85	.80	7.34	7.18	5.5	7.7	2.6	22.6
	750	.3973	5.25	2.38	25.28	1.23	14.20	15.02	6.5	8.5	5.2	45.7
	850	.4220	9.94	6.19	44.99	1.83	26.85	29.91	8.7	10.8	9.8	89.4
	950	.4749	11.87	9.32	53.87	1.77	32.77	38.27	9.5	11.5	11.4	112.7
2	50	.3517	.07	.00	1.60	.15	.73	.29	3.0	5.1	.2	1.9
	150	.3593	.07	.00	2.00	.15	.89	.45	4.2	7.1	.3	2.3
	250	.3657	.08	.00	2.64	.15	1.06	.60	4.8	8.1	.4	2.9
	350	.3710	.08	.08	3.53	.23	1.46	.92	5.0	8.2	.5	4.1
	450	.3756	.23	.08	5.12	.31	2.10	1.63	5.0	7.8	.7	6.1
	550	.3803	.63	.24	8.01	.47	3.54	3.22	5.1	7.6	1.2	10.3
	650	.3864	1.76	.80	14.29	.72	7.03	7.19	5.9	8.1	2.7	22.4
	750	.3974	4.76	2.96	28.66	1.23	15.27	17.24	7.6	9.7	6.1	52.5
	850	.4221	9.24	8.02	51.72	1.74	29.22	35.76	10.1	12.0	11.4	104.1
	950	.4749	11.28	11.48	62.40	1.67	36.50	45.04	10.8	12.9	13.0	130.4
3	50	.3518	.07	.00	1.45	.15	.73	.29	2.4	4.0	.2	1.8
	150	.3593	.07	.00	1.93	.15	.82	.37	3.7	6.2	.3	2.2
	250	.3657	.08	.00	2.49	.15	1.06	.53	4.5	7.6	.3	2.9
	350	.3710	.08	.08	3.37	.23	1.38	.84	4.7	7.7	.5	3.8
	450	.3757	.23	.08	4.81	.31	2.02	1.55	4.7	7.4	.7	5.7
	550	.3804	.63	.24	7.78	.47	3.38	3.22	5.0	7.5	1.2	10.1
	650	.3865	1.76	.88	14.61	.72	6.79	7.43	5.9	8.1	2.6	22.7
	750	.3974	4.68	3.37	29.89	1.23	14.94	17.82	7.6	9.8	5.9	53.9
	850	.4221	9.33	9.51	54.59	1.74	28.61	38.46	9.9	11.9	11.3	108.9
	950	.4749	11.19	12.95	65.64	1.57	36.60	47.39	11.2	13.2	13.3	135.2

PREDICTED ION CONCENTRATIONS, ESP, SAR, EC, AND DISSOLVED CATIONS OF THE SOIL PROFILE FOR TREATMENT NO. 22 (WATER TABLE DEPTH 1000 MM; WATER TABLE EC 6 DS/M; SANDY LOAM SOIL; WHEAT CROP; 14 DAYS IRRIGATION INTERVAL WITH IRRIGATION APPLICATION AMOUNT AS 0.50 OF ET)

End of Year	Depth (mm)	Theta (cm3/cm3)	Ca	Mg	Na	K	Cl	SO4	ESP	SAR	EC (ds/m)	Diss. Cat. (meq/l)
			mmol/l									
1	50	.3486	.14	.07	3.17	.22	1.30	.86	4.1	6.7	.4	3.7
	150	.3555	.22	.07	5.14	.29	2.13	1.69	4.7	7.4	.7	6.2
	250	.3611	.60	.22	7.98	.45	3.43	2.91	5.1	7.6	1.1	10.1
	350	.3654	1.13	.45	11.17	.60	4.98	4.61	5.3	7.6	1.7	15.0
	450	.3692	1.91	.76	14.11	.76	6.71	6.48	5.3	7.6	2.2	20.5
	550	.3738	3.01	1.24	17.45	.93	9.11	8.96	5.5	7.4	3.1	28.1
	650	.3810	5.75	2.36	24.25	1.26	15.43	14.80	5.8	7.6	5.0	46.6
	750	.3944	10.10	4.97	41.97	1.71	31.05	27.95	7.9	9.8	9.3	89.6
	850	.4210	10.18	10.00	69.24	2.17	50.62	42.45	11.6	14.4	13.8	138.9
	950	.4746	11.67	11.96	65.50	1.67	46.19	44.91	11.0	13.2	13.9	139.8
2	50	.3488	.14	.07	2.88	.22	1.30	.79	3.6	5.9	.4	3.5
	150	.3558	.22	.07	4.78	.29	2.13	1.47	4.3	6.8	.7	5.8
	250	.3615	.60	.22	7.77	.45	3.59	2.76	4.9	7.3	1.2	9.9
	350	.3659	1.36	.60	11.87	.68	5.97	4.99	5.1	7.3	1.9	16.6
	450	.3698	2.90	1.22	17.27	.92	9.93	8.56	5.5	7.4	3.2	28.0
	550	.3743	5.49	2.40	25.83	1.24	17.17	14.62	6.3	8.2	5.3	47.9
	650	.3814	8.59	4.65	42.16	1.65	31.05	24.90	8.3	10.4	8.9	83.5
	750	.3946	9.54	9.62	70.77	2.04	53.73	40.19	11.8	14.9	13.9	137.3
	850	.4211	9.48	16.97	98.66	2.35	73.26	56.90	14.7	18.2	18.7	191.0
	950	.4746	11.08	17.06	86.39	1.67	62.56	55.21	13.2	15.8	16.9	177.0
3	50	.3489	.14	.07	3.03	.22	1.44	.87	3.2	5.2	.4	3.7
	150	.3560	.37	.15	5.15	.37	2.57	1.77	4.0	6.1	.8	6.6
	250	.3616	.90	.37	8.67	.52	4.71	3.51	4.6	6.7	1.4	12.0
	350	.3661	1.97	.83	13.84	.76	8.40	6.58	5.2	7.3	2.6	22.2
	450	.3701	3.75	1.61	21.64	1.07	14.68	11.78	6.3	8.3	4.4	39.5
	550	.3746	5.96	3.33	35.22	1.39	25.39	20.66	8.1	10.4	7.6	69.6
	650	.3816	8.83	7.17	58.11	1.81	43.52	36.50	10.5	13.1	12.4	119.6
	750	.3947	8.64	14.27	91.58	2.28	69.24	54.96	14.2	17.6	18.1	182.8
	850	.4211	8.70	22.10	118.33	2.44	87.70	71.52	16.7	20.1	22.5	235.1
	950	.4746	10.49	20.69	100.41	1.67	73.54	65.01	14.7	17.4	19.5	208.1

PREDICTED ION CONCENTRATIONS, ESP, SAR, EC, AND DISSOLVED CATIONS OF THE SOIL PROFILE FOR TREATMENT NO. 23 (WATER TABLE DEPTH 1000 MM; WATER TABLE EC 6 DS/M; SANDY LOAM SOIL; WHEAT CROP; 04 DAYS IRRIGATION INTERVAL WITH IRRIGATION APPLICATION AMOUNT AS 0.75 OF ET)

End of Year	Depth (mm)	Theta (cm3/cm3)	Ca	Mg	Na	K	Cl	SO4	ESP	SAR	EC (ds/m)	Diss. Cat. (meq/l)
			----------	----------	----------	mmol/l	----------	----------				
1	50	.3371	.14	.07	2.86	.21	1.25	.70	3.6	5.8	.4	3.4
	150	.3425	.28	.14	5.66	.35	2.41	1.63	4.7	7.4	.8	6.9
	250	.3467	1.07	.43	10.89	.57	4.94	4.01	5.2	7.5	1.6	14.5
	350	.3504	2.68	1.09	16.94	.87	8.47	7.67	5.4	7.5	2.8	25.3
	450	.3552	3.82	1.61	19.67	1.03	10.35	9.98	5.4	7.3	3.4	31.6
	550	.3626	3.97	1.65	19.63	1.05	10.41	10.49	5.4	7.2	3.4	32.3
	650	.3740	4.95	2.01	21.56	1.16	11.82	12.83	5.5	7.2	4.1	38.5
	750	.3912	8.81	3.72	29.74	1.54	19.40	21.50	6.1	7.6	6.7	64.1
	850	.4200	10.85	5.90	44.17	1.91	31.41	31.59	8.2	10.1	10.0	97.5
	950	.4743	12.05	8.04	46.74	1.76	31.95	36.94	8.5	10.3	11.1	109.2
2	50	.3393	.14	.07	2.73	.21	1.26	.70	2.9	4.8	.4	3.4
	150	.3451	.36	.14	5.85	.36	2.64	1.64	4.3	6.8	.9	7.3
	250	.3496	1.30	.58	11.99	.65	5.71	4.41	5.2	7.5	1.9	16.4
	350	.3535	3.65	1.53	20.45	1.02	10.88	9.49	5.7	7.7	3.5	31.8
	450	.3580	6.73	2.81	27.22	1.33	16.35	15.75	5.9	7.6	5.2	49.4
	550	.3647	9.19	3.84	31.50	1.51	21.40	22.30	6.1	7.5	7.1	68.2
	650	.3752	9.46	4.42	37.05	1.63	28.14	29.46	7.2	8.8	9.3	89.8
	750	.3917	9.55	5.83	47.83	1.78	38.12	35.45	9.0	11.0	11.4	112.0
	850	.4202	9.98	9.20	62.16	2.00	46.88	42.80	10.8	13.3	13.6	136.0
	950	.4743	11.66	10.88	59.29	1.67	43.22	43.71	10.2	12.2	13.4	134.3
3	50	.3411	.21	.07	2.75	.28	1.34	.78	2.5	4.1	.4	3.6
	150	.3471	.50	.22	6.10	.43	2.94	2.01	3.9	6.1	.9	8.0
	250	.3519	1.74	.73	13.31	.73	7.13	5.67	5.1	7.2	2.1	19.1
	350	.3559	4.71	1.99	23.90	1.18	15.15	13.16	6.1	7.9	4.6	42.7
	450	.3603	6.77	3.28	34.02	1.41	25.09	22.93	7.4	9.3	7.8	73.6
	550	.3665	8.71	4.32	41.27	1.59	34.45	31.27	8.2	10.0	10.4	99.8
	650	.3762	9.09	5.67	50.76	1.71	43.29	36.07	9.5	11.7	12.1	118.3
	750	.3922	9.16	8.51	64.18	1.94	52.59	42.62	11.1	13.8	14.1	141.2
	850	.4203	9.55	12.59	76.16	2.08	57.66	50.54	12.4	15.1	16.0	162.4
	950	.4744	11.37	13.23	69.10	1.57	51.26	49.01	11.5	13.6	15.1	153.1

PREDICTED ION CONCENTRATIONS, ESP, SAR, EC, AND DISSOLVED CATIONS OF THE SOIL PROFILE FOR TREATMENT NO. 24 (WATER TABLE DEPTH 1000 MM; WATER TABLE EC 6 DS/M; SANDY LOAM SOIL; WHEAT CROP; 04 DAYS IRRIGATION INTERVAL WITH IRRIGATION APPLICATION AMOUNT AS 0.50 OF ET)

End of Year	Depth (mm)	Theta (cm3/cm3)	Ca	Mg	Na	K	Cl	SO4	ESP	SAR	EC (ds/m)	Diss. Cat. (meq/l)
			mmol/l									
1	50	.3397	.28	.14	4.98	.35	2.18	1.54	3.9	6.2	.7	6.2
	150	.3453	1.00	.43	10.13	.57	4.64	3.78	4.9	7.3	1.5	13.5
	250	.3495	2.46	1.01	15.81	.87	7.87	7.22	5.3	7.3	2.6	23.5
	350	.3528	3.21	1.38	17.86	.95	9.18	8.97	5.2	7.1	3.1	28.3
	450	.3569	3.17	1.33	17.48	.96	9.00	9.00	5.2	7.1	3.0	27.8
	550	.3637	4.13	1.73	19.69	1.05	10.75	10.90	5.3	7.1	3.6	33.3
	650	.3745	8.43	3.56	28.86	1.55	19.96	17.18	5.7	7.4	5.9	55.7
	750	.3914	13.18	6.31	47.95	2.02	38.90	21.11	7.5	9.8	9.4	89.1
	850	.4201	10.50	9.63	68.66	2.17	52.43	40.45	11.4	14.4	13.7	136.6
	950	.4743	11.76	10.88	57.43	1.67	39.49	41.75	9.9	11.9	12.6	126.6
2	50	.3404	.49	.21	5.77	.42	2.74	1.90	3.6	5.6	.9	7.7
	150	.3461	1.79	.72	13.09	.72	6.58	5.22	4.9	7.0	2.1	18.8
	250	.3503	4.63	1.95	22.15	1.16	12.74	10.71	5.6	7.4	4.0	36.5
	350	.3537	7.53	3.14	27.84	1.39	18.34	15.42	5.7	7.3	5.4	50.9
	450	.3578	9.68	4.07	31.79	1.55	24.54	19.44	5.8	7.4	6.9	65.5
	550	.3643	9.78	4.67	39.59	1.66	35.90	25.29	7.3	9.1	9.3	89.0
	650	.3748	10.22	6.35	56.99	1.86	52.81	30.12	9.7	12.4	11.9	115.7
	750	.3915	9.63	10.92	81.78	2.18	68.76	42.63	12.7	16.3	15.6	157.3
	850	.4201	9.37	16.75	94.09	2.34	68.74	56.85	14.1	17.2	18.0	186.3
	950	.4743	11.37	14.41	68.21	1.47	46.45	48.51	11.1	13.1	14.4	147.4
3	50	.3407	.92	.42	6.90	.49	4.01	2.75	3.4	5.1	1.2	10.0
	150	.3464	3.01	1.29	16.60	.93	11.09	8.09	5.0	6.8	3.1	28.1
	250	.3507	6.52	2.90	29.27	1.38	23.98	17.61	6.4	8.1	6.6	61.8
	350	.3541	7.97	3.95	38.19	1.54	37.46	26.48	7.6	9.4	9.8	93.1
	450	.3581	9.25	4.96	46.91	1.63	49.13	30.63	8.6	10.7	11.8	113.1
	550	.3645	9.26	6.55	62.81	1.81	62.13	34.64	10.7	13.7	13.7	134.2
	650	.3750	8.83	10.85	85.69	2.17	76.47	45.64	13.2	17.0	16.9	170.9
	750	.3916	8.41	17.96	107.69	2.43	85.68	61.09	15.2	18.9	20.2	211.7
	850	.4201	8.85	21.96	109.02	2.34	76.99	68.05	15.4	18.3	20.4	217.3
	950	.4743	11.07	16.66	74.18	1.37	50.17	52.92	11.9	13.9	15.5	160.0

PREDICTED ION CONCENTRATIONS, ESP, SAR, EC, AND DISSOLVED CATIONS OF THE SOIL PROFILE FOR TREATMENT NO. 25 (WATER TABLE DEPTH 1000 MM; WATER TABLE EC 6 DS/M; CLAY LOAM SOIL; COTTON CROP; 14 DAYS IRRIGATION INTERVAL WITH IRRIGATION APPLICATION AMOUNT AS 0.75 OF ET)

End of Year	Depth (mm)	Theta (cm3/cm3)	Ca	Mg	Na	K	Cl	SO4	ESP	SAR	EC (ds/m)	Diss. Cat. (meq/l)
			mmol/l									
1	50	.3815	.08	.00	2.44	.16	1.02	.63	4.4	7.5	.3	2.8
	150	.3860	.08	.08	3.35	.24	1.36	.96	4.9	8.1	.5	3.8
	250	.3912	.16	.08	4.85	.32	1.94	1.54	5.3	8.4	.7	5.7
	350	.3971	.41	.16	7.06	.41	2.87	2.54	5.4	8.4	1.0	8.6
	450	.4041	.92	.42	10.10	.58	4.43	4.26	5.5	8.1	1.5	13.4
	550	.4127	2.05	.85	14.67	.85	7.08	7.50	5.7	7.9	2.5	23.0
	650	.4237	4.55	1.93	22.76	1.23	12.34	14.09	6.4	8.3	4.5	42.2
	750	.4386	8.25	4.26	36.16	1.63	20.75	25.19	7.8	9.7	7.7	74.5
	850	.4619	11.55	7.44	47.62	1.91	28.25	36.65	8.8	10.7	10.5	104.8
	950	.4820	12.15	9.06	47.80	1.49	28.88	38.54	8.7	10.4	11.0	109.4
2	50	.3829	.08	.00	1.74	.16	.79	.40	3.3	5.7	.3	2.0
	150	.3872	.08	.00	2.08	.16	.88	.48	4.2	7.2	.3	2.3
	250	.3923	.08	.00	2.59	.16	1.05	.65	4.7	7.9	.4	2.9
	350	.3981	.16	.08	3.70	.25	1.48	1.15	4.9	7.9	.5	4.3
	450	.4051	.33	.17	6.03	.42	2.51	2.43	4.9	7.6	.9	7.6
	550	.4135	1.11	.51	10.51	.60	4.61	5.30	5.3	7.6	1.8	16.0
	650	.4242	2.89	1.49	18.76	.96	8.59	11.22	6.3	8.4	3.5	32.8
	750	.4389	5.98	3.90	31.10	1.45	14.51	21.40	7.4	9.4	6.3	60.8
	850	.4621	11.36	7.54	42.49	1.62	20.53	35.71	7.9	9.5	9.5	95.2
	950	.4820	11.85	9.36	47.00	1.29	24.10	39.24	8.7	10.2	10.6	106.1
3	50	.3840	.08	.08	2.06	.24	.95	.56	2.8	4.6	.3	2.6
	150	.3884	.08	.08	2.81	.24	1.20	.80	3.8	6.3	.4	3.3
	250	.3933	.16	.08	3.90	.24	1.54	1.30	4.3	6.9	.6	4.7
	350	.3991	.49	.16	6.02	.41	2.47	2.56	4.4	6.6	.9	7.9
	450	.4058	1.43	.59	10.15	.67	4.70	5.62	4.5	6.5	1.9	16.4
	550	.4140	3.68	1.80	17.88	1.03	9.49	11.89	5.4	7.0	3.8	34.5
	650	.4245	6.84	4.03	30.87	1.40	17.72	22.10	7.0	8.8	6.7	63.9
	750	.4391	10.61	7.98	47.63	1.81	26.85	36.20	8.6	10.5	10.2	102.4
	850	.4622	11.08	10.79	56.25	1.72	32.28	42.69	9.8	11.7	12.0	121.4
	950	.4820	11.75	11.45	54.37	1.20	32.76	42.72	9.6	11.3	12.1	121.8

PREDICTED ION CONCENTRATIONS, ESP, SAR, EC, AND DISSOLVED CATIONS OF THE SOIL PROFILE FOR TREATMENT NO. 26 (WATER TABLE DEPTH 1000 MM; WATER TABLE EC 6 DS/M; CLAY LOAM SOIL; COTTON CROP; 14 DAYS IRRIGATION INTERVAL WITH IRRIGATION APPLICATION AMOUNT AS 0.50 OF ET)

End of Year	Depth (mm)	Theta (cm3/cm3)	Ca	Mg	Na	K	Cl	SO4	ESP	SAR	EC (ds/m)	Diss. Cat. (meq/l)
			mmol/l									
1	50	.3812	.55	.24	7.25	.47	2.91	2.44	4.7	7.1	1.1	9.6
	150	.3858	.88	.40	9.80	.56	4.07	3.67	5.3	7.7	1.5	13.9
	250	.3910	1.53	.65	13.09	.73	5.82	5.65	5.6	7.8	2.2	20.0
	350	.3970	2.46	1.07	16.16	.90	7.79	7.96	5.7	7.8	2.9	26.6
	450	.4041	4.01	1.67	19.95	1.09	10.69	11.44	5.8	7.7	3.9	36.2
	550	.4127	6.99	2.90	26.60	1.45	16.71	17.74	6.1	7.8	5.8	54.8
	650	.4237	10.77	4.90	39.13	1.84	28.36	27.84	7.4	9.2	8.9	87.0
	750	.4386	11.33	7.52	57.09	2.08	42.32	36.70	10.0	12.5	11.9	119.1
	850	.4619	11.45	10.59	64.51	2.10	44.57	43.52	11.0	13.5	13.4	135.2
	950	.4820	12.25	10.66	52.68	1.39	34.06	40.83	9.3	11.1	11.9	118.9
2	50	.3829	.24	.08	3.80	.32	1.74	1.27	4.0	6.3	.6	4.7
	150	.3872	.40	.16	5.92	.40	2.72	2.24	4.6	7.0	.9	7.8
	250	.3923	.89	.41	9.16	.57	4.46	4.05	5.1	7.5	1.5	13.8
	350	.3981	1.81	.74	13.82	.74	7.48	7.16	5.6	7.7	2.6	23.9
	450	.4051	3.18	1.42	20.51	1.00	12.81	12.47	6.6	8.7	4.5	41.8
	550	.4135	5.89	3.16	32.89	1.37	21.70	21.02	7.9	10.1	7.0	67.2
	650	.4242	8.41	5.96	50.05	1.84	33.83	32.95	9.9	12.4	10.4	103.2
	750	.4389	10.25	10.61	68.65	2.18	45.70	46.61	11.6	14.3	14.0	142.6
	850	.4621	10.60	13.65	76.76	2.00	51.46	52.51	12.6	15.3	15.7	160.5
	950	.4820	11.35	14.04	71.90	1.39	49.69	51.09	12.1	14.2	15.3	155.8
3	50	.3839	.79	.32	6.42	.48	3.57	3.01	3.7	5.5	1.2	10.1
	150	.3883	1.36	.56	9.55	.64	5.62	4.97	4.3	6.1	1.9	16.4
	250	.3933	2.52	1.06	14.38	.89	8.94	8.37	5.1	6.9	3.0	27.1
	350	.3990	4.37	1.90	21.85	1.15	14.67	13.93	6.1	7.9	4.8	44.6
	450	.4057	7.04	3.52	34.03	1.42	24.39	22.72	7.5	9.6	7.6	72.9
	550	.4140	9.32	6.50	53.20	1.88	39.35	35.41	9.9	12.3	11.5	113.3
	650	.4245	9.74	11.31	77.53	2.19	55.96	49.73	12.8	15.9	15.6	159.2
	750	.4391	9.62	16.06	93.90	2.36	65.05	60.33	14.5	17.7	18.2	189.7
	850	.4622	10.31	17.38	89.48	2.01	60.64	60.16	13.9	16.6	17.8	185.2
	950	.4820	11.25	15.34	73.00	1.29	50.29	52.48	12.0	14.0	15.6	159.3

PREDICTED ION CONCENTRATIONS, ESP, SAR, EC, AND DISSOLVED CATIONS OF THE SOIL PROFILE FOR TREATMENT NO. 27 (WATER TABLE DEPTH 1000 MM; WATER TABLE EC 6 DS/M; CLAY LOAM SOIL; COTTON CROP; 04 DAYS IRRIGATION INTERVAL WITH IRRIGATION APPLICATION AMOUNT AS 0.75 OF ET)

End of Year	Depth (mm)	Theta (cm3/cm3)	Ca	Mg	Na	K	Cl	SO4	ESP	SAR	EC (ds/m)	Diss. Cat. (meq/l)
			------	------	------	mmol/l	------	------				
1	50	.3874	.16	.08	3.84	.24	1.60	1.04	4.3	7.0	.5	4.6
	150	.3921	.41	.16	7.05	.41	3.00	2.27	5.3	8.3	1.0	8.6
	250	.3972	1.15	.49	11.90	.66	5.33	4.68	5.7	8.5	1.7	15.8
	350	.4027	2.50	1.08	17.39	.92	8.40	7.99	6.1	8.4	2.8	25.5
	450	.4089	4.31	1.77	22.13	1.18	11.41	11.83	6.2	8.3	3.9	36.2
	550	.4163	6.36	2.67	25.98	1.38	14.45	16.43	6.3	8.0	5.2	48.9
	650	.4260	9.15	3.78	30.98	1.67	19.36	23.59	6.5	8.1	7.2	68.6
	750	.4399	11.18	5.27	39.45	1.91	26.81	31.72	7.6	9.4	9.7	93.3
	850	.4627	11.57	6.98	46.65	2.01	31.83	36.81	8.7	10.6	11.1	108.8
	950	.4821	12.15	8.27	45.32	1.59	29.98	37.45	8.3	10.0	11.0	108.3
2	50	.3913	.16	.08	2.99	.24	1.37	.81	3.3	5.4	.5	3.7
	150	.3958	.33	.16	5.23	.33	2.29	1.64	4.7	7.3	.8	6.5
	250	.4002	.83	.33	9.34	.58	4.22	3.56	5.4	8.0	1.4	12.2
	350	.4049	2.09	.92	15.56	.84	7.78	7.19	5.9	8.3	2.5	22.9
	450	.4104	4.58	1.95	23.91	1.19	13.48	13.23	6.5	8.6	4.4	41.1
	550	.4172	7.93	3.45	33.79	1.55	21.29	21.29	7.3	9.3	6.9	65.8
	650	.4265	11.10	5.55	45.21	1.94	30.14	30.75	8.4	10.4	9.7	94.6
	750	.4402	11.10	7.82	56.03	2.09	38.20	37.38	9.9	12.4	11.7	116.2
	850	.4629	11.38	10.04	61.50	2.01	42.37	42.18	10.6	13.0	13.0	130.3
	950	.4821	11.95	10.86	59.37	1.49	41.54	42.83	10.4	12.4	13.1	130.7
3	50	.3995	.58	.25	4.70	.41	2.56	1.73	3.1	4.7	.9	6.9
	150	.4034	1.08	.50	8.33	.67	4.42	3.42	4.3	6.3	1.5	12.2
	250	.4059	2.52	1.01	14.59	.92	8.30	7.04	5.2	7.2	2.7	23.0
	350	.4082	5.23	2.19	23.78	1.27	15.27	13.49	6.2	8.1	4.8	43.4
	450	.4115	8.76	3.83	36.13	1.62	26.10	22.70	7.5	9.4	7.8	73.5
	550	.4171	10.86	5.69	51.53	1.90	39.73	32.32	9.4	11.8	11.0	107.4
	650	.4261	10.56	8.36	67.88	2.20	51.77	40.41	11.6	14.7	13.6	135.9
	750	.4398	10.36	11.63	77.51	2.27	54.97	47.71	12.6	15.8	15.1	154.0
	850	.4626	10.99	12.90	71.68	2.01	47.88	48.36	11.9	14.3	14.5	148.3
	950	.4820	11.75	11.95	58.46	1.39	38.84	44.12	10.1	12.0	13.0	130.8

PREDICTED ION CONCENTRATIONS, ESP, SAR, EC, AND DISSOLVED CATIONS OF THE SOIL PROFILE FOR TREATMENT NO. 28 (WATER TABLE DEPTH 1000 MM; WATER TABLE EC 6 DS/M; CLAY LOAM SOIL; COTTON CROP; 04 DAYS IRRIGATION INTERVAL WITH IRRIGATION APPLICATION AMOUNT AS 0.50 OF ET)

End of Year	Depth (mm)	Theta (cm3/cm3)	Ca	Mg	Na	K	Cl	SO4	ESP	SAR	EC (ds/m)	Diss. Cat. (meq/l)
			mmol/l									
1	50	.3851	.72	.32	8.12	.48	3.66	3.02	4.8	7.2	1.2	10.7
	150	.3896	1.85	.80	14.49	.80	6.84	6.20	5.7	8.0	2.2	20.4
	250	.3947	3.51	1.47	20.31	1.06	10.28	9.95	6.0	8.2	3.4	31.4
	350	.4005	4.88	1.99	23.09	1.24	12.25	12.74	6.0	8.0	4.1	39.0
	450	.4071	6.22	2.61	25.40	1.35	14.21	16.15	6.1	7.8	5.1	47.9
	550	.4150	9.00	3.69	30.35	1.63	20.06	23.07	6.3	7.9	7.1	68.1
	650	.4252	11.07	5.10	40.06	1.84	31.19	31.10	7.6	9.3	10.0	96.4
	750	.4395	10.99	6.99	53.58	2.09	42.04	37.50	9.7	12.1	12.2	120.3
	850	.4625	11.37	9.27	58.48	2.10	42.14	41.66	10.2	12.6	13.0	129.0
	950	.4820	12.15	9.86	49.59	1.49	33.66	39.24	8.9	10.6	11.7	115.7
2	50	.3829	1.19	.55	8.78	.63	4.67	4.03	4.1	5.9	1.5	13.1
	150	.3872	2.64	1.12	16.00	.96	8.96	8.24	5.4	7.4	2.9	26.2
	250	.3923	5.59	2.35	25.61	1.30	16.29	15.32	6.3	8.2	5.1	48.4
	350	.3981	8.97	3.78	35.29	1.65	26.16	23.85	7.2	9.0	7.9	76.0
	450	.4051	10.46	5.19	45.87	1.84	37.83	31.72	8.5	10.6	10.7	104.1
	550	.4135	10.25	6.41	58.10	1.96	49.89	37.85	10.5	13.2	13.1	128.8
	650	.4242	10.08	8.94	71.43	2.19	58.90	45.40	12.3	15.3	15.3	153.1
	750	.4389	10.07	12.24	79.35	2.36	60.85	51.69	13.0	16.1	16.5	168.0
	850	.4621	10.69	13.84	74.95	2.00	54.99	51.94	12.2	14.8	16.0	162.7
	950	.4820	11.65	13.15	63.84	1.29	46.61	47.30	10.9	12.7	14.4	145.0
3	50	.3944	4.24	1.79	16.30	1.06	13.12	10.67	4.6	6.0	4.0	35.4
	150	.3979	6.74	2.80	26.23	1.40	21.79	17.84	6.1	7.7	6.4	59.0
	250	.4005	9.52	4.14	38.64	1.65	34.51	27.14	7.7	9.5	9.6	91.3
	350	.4036	10.09	5.42	52.45	1.83	49.28	35.77	9.8	12.2	12.8	123.8
	450	.4083	9.87	7.09	68.67	2.02	64.87	42.43	12.1	15.4	15.5	153.1
	550	.4152	9.44	10.55	87.76	2.32	78.06	52.59	14.3	18.2	18.5	186.8
	650	.4251	9.13	15.19	102.32	2.55	82.39	62.01	15.5	19.4	20.3	210.5
	750	.4393	9.44	18.06	101.11	2.54	73.25	64.72	15.1	18.3	19.8	206.9
	850	.4623	10.41	16.91	82.24	1.91	55.78	57.31	13.0	15.4	16.9	174.6
	950	.4820	11.55	13.94	61.94	1.10	41.83	47.30	10.5	12.2	13.9	140.3

PREDICTED ION CONCENTRATIONS, ESP, SAR, EC, AND DISSOLVED CATIONS OF THE SOIL PROFILE FOR TREATMENT NO. 29 (WATER TABLE DEPTH 1000 MM; WATER TABLE EC 6 DS/M; CLAY LOAM SOIL; WHEAT CROP; 14 DAYS IRRIGATION INTERVAL WITH IRRIGATION APPLICATION AMOUNT AS 0.75 OF ET)

End of Year	Depth (mm)	Theta (cm3/cm3)	Ca	Mg	Na	K	Cl	SO4	ESP	SAR	EC (ds/m)	Diss. Cat. (meq/l)
			mmol/l									
1	50	.3951	.00	.00	1.96	.16	.82	.41	4.2	7.2	.3	2.2
	150	.4000	.08	.00	2.56	.17	.99	.66	5.0	8.5	.3	2.8
	250	.4046	.08	.00	3.51	.17	1.42	1.00	5.4	9.0	.5	4.0
	350	.4092	.17	.08	4.99	.25	2.03	1.61	5.6	9.0	.7	5.8
	450	.4142	.43	.17	7.36	.43	3.08	2.82	5.6	8.6	1.0	9.1
	550	.4202	1.13	.52	11.37	.69	5.12	5.21	5.7	8.2	1.8	16.1
	650	.4285	3.01	1.33	18.41	.97	9.21	10.36	6.2	8.4	3.4	30.9
	750	.4413	6.38	3.10	30.64	1.46	16.59	19.88	7.5	9.6	6.2	58.1
	850	.4636	11.49	7.09	45.40	1.92	25.10	34.20	8.5	10.3	9.9	96.6
	950	.4822	12.15	9.07	48.82	1.59	28.69	37.86	8.8	10.6	10.9	108.0
2	50	.3951	.08	.00	1.71	.16	.73	.33	3.3	5.7	.3	2.0
	150	.4000	.08	.00	2.15	.17	.91	.50	4.5	7.7	.3	2.4
	250	.4046	.08	.00	2.76	.17	1.09	.75	5.0	8.4	.4	3.1
	350	.4092	.17	.08	3.89	.25	1.61	1.27	5.0	8.2	.5	4.5
	450	.4142	.34	.17	5.99	.34	2.48	2.31	5.0	7.8	.8	7.4
	550	.4202	1.04	.43	10.33	.61	4.60	4.95	5.5	7.9	1.7	14.9
	650	.4285	2.74	1.33	18.77	.97	9.03	10.62	6.5	8.7	3.4	31.4
	750	.4413	3.83	2.64	29.54	1.19	16.78	21.15	8.8	11.1	5.9	51.6
	850	.4636	11.40	8.72	49.81	1.82	25.77	38.03	9.0	10.9	10.4	105.1
	950	.4822	11.86	10.56	53.60	1.39	29.79	41.25	9.5	11.3	11.5	115.9
3	50	.3951	.08	.00	1.55	.16	.73	.33	2.7	4.5	.3	2.0
	150	.4000	.08	.00	1.98	.17	.83	.50	3.9	6.6	.3	2.3
	250	.4046	.08	.00	2.59	.17	1.09	.75	4.5	7.4	.4	3.0
	350	.4092	.17	.08	3.64	.25	1.52	1.27	4.6	7.4	.5	4.3
	450	.4142	.34	.17	5.73	.34	2.40	2.40	4.8	7.3	.9	7.4
	550	.4202	.95	.43	9.98	.61	4.43	5.04	5.4	7.7	1.7	15.0
	650	.4285	2.48	1.51	18.59	.89	8.76	10.89	6.6	8.9	3.5	31.9
	750	.4413	5.56	4.19	33.28	1.37	16.32	21.70	8.1	10.3	6.6	63.6
	850	.4636	11.02	9.20	49.81	1.72	25.00	39.27	9.1	10.8	10.7	107.0
	950	.4822	11.66	11.06	54.10	1.30	29.39	42.84	9.6	11.4	11.8	118.8

PREDICTED ION CONCENTRATIONS, ESP, SAR, EC, AND DISSOLVED CATIONS OF THE SOIL PROFILE FOR TREATMENT NO. 30 (WATER TABLE DEPTH 1000 MM; WATER TABLE EC 6 DS/M; CLAY LOAM SOIL; WHEAT CROP; 14 DAYS IRRIGATION INTERVAL WITH IRRIGATION APPLICATION AMOUNT AS 0.50 OF ET)

End of Year	Depth (mm)	Theta (cm3/cm3)	Ca	Mg	Na	K	Cl	SO4	ESP	SAR	EC (ds/m)	Diss. Cat. (meq/l)
			--------	--------	mmol/l	--------	--------	--------				
1	50	.3942	.08	.08	3.50	.24	1.47	.98	4.6	7.6	.5	4.1
	150	.3990	.25	.08	5.44	.33	2.23	1.81	5.2	8.2	.7	6.4
	250	.4036	.50	.25	7.92	.50	3.34	2.92	5.5	8.4	1.1	9.8
	350	.4083	1.01	.42	10.97	.59	4.81	4.56	5.7	8.4	1.6	14.5
	450	.4134	1.96	.85	14.78	.85	7.09	7.09	5.8	8.1	2.5	22.1
	550	.4195	3.99	1.65	20.71	1.13	11.53	11.70	6.2	8.1	4.1	36.1
	650	.4281	7.52	3.27	31.58	1.50	20.17	20.26	7.3	9.1	7.0	62.6
	750	.4410	10.75	6.20	48.75	2.00	33.17	32.16	9.4	11.7	10.9	100.5
	850	.4635	11.40	9.58	62.15	2.11	42.52	41.37	11.0	13.6	13.3	128.8
	950	.4822	11.96	10.86	58.88	1.69	39.45	42.44	10.0	11.9	12.6	128.0
2	50	.3942	.16	.08	3.34	.24	1.47	.98	4.0	6.5	.5	4.0
	150	.3991	.33	.16	5.28	.33	2.39	1.90	4.6	7.3	.8	6.5
	250	.4037	.67	.33	8.17	.50	3.84	3.34	5.0	7.5	1.2	10.9
	350	.4084	1.52	.68	12.24	.76	6.33	5.82	5.4	7.7	2.1	18.6
	450	.4134	3.07	1.28	18.53	1.02	10.59	10.16	6.1	8.2	3.5	31.9
	550	.4196	5.64	2.69	29.48	1.39	18.55	17.95	7.4	9.5	5.9	56.1
	650	.4281	8.93	5.57	47.85	1.77	31.93	30.69	9.5	11.9	9.9	96.5
	750	.4411	10.39	10.85	71.91	2.28	48.58	46.11	12.0	14.9	14.2	144.4
	850	.4635	10.63	14.65	83.60	2.20	57.46	54.11	13.4	16.3	16.5	169.8
	950	.4822	11.46	14.35	72.73	1.39	50.91	50.41	12.0	14.2	15.3	155.6
3	50	.3942	.24	.08	3.50	.33	1.71	1.22	3.5	5.6	.5	4.4
	150	.3991	.49	.16	5.77	.41	2.97	2.39	4.1	6.3	.9	7.8
	250	.4037	1.00	.42	9.18	.58	5.00	4.34	4.8	6.9	1.6	14.1
	350	.4084	2.03	.84	14.34	.84	8.44	7.68	5.7	7.8	2.8	24.5
	450	.4134	3.67	1.71	22.81	1.11	14.18	13.24	7.0	9.2	4.7	42.1
	550	.4196	6.16	3.90	37.28	1.47	24.10	22.97	8.8	11.2	8.0	73.3
	650	.4281	9.46	8.23	59.79	1.95	39.80	39.54	11.1	13.7	13.0	122.3
	750	.4411	9.84	13.67	84.57	2.28	57.96	54.68	14.1	17.3	17.4	171.2
	850	.4635	10.15	17.43	95.86	2.20	66.36	62.63	15.0	18.0	19.2	195.8
	950	.4822	11.06	16.74	83.59	1.49	57.88	57.49	12.8	15.0	16.5	177.1

PREDICTED ION CONCENTRATIONS, ESP, SAR, EC, AND DISSOLVED CATIONS OF THE SOIL PROFILE FOR TREATMENT NO. 31 (WATER TABLE DEPTH 1000 MM; WATER TABLE EC 6 DS/M; CLAY LOAM SOIL; WHEAT CROP; 04 DAYS IRRIGATION INTERVAL WITH IRRIGATION APPLICATION AMOUNT AS 0.75 OF ET)

End of Year	Depth (mm)	Theta (cm3/cm3)	Ca	Mg	Na	K	Cl	SO4	ESP	SAR	EC (ds/m)	Diss. Cat. (meq/l)
			----------	----------	----------	mmol/l	----------	----------				
1	50	.3891	.08	.08	3.05	.24	1.29	.80	4.0	6.6	.4	3.6
	150	.3937	.24	.08	5.37	.33	2.28	1.55	5.2	8.4	.7	6.3
	250	.3985	.66	.25	9.06	.49	3.87	3.21	5.7	8.6	1.3	11.4
	350	.4036	1.58	.67	13.93	.75	6.34	5.75	6.0	8.6	2.1	19.1
	450	.4093	2.96	1.27	18.86	1.01	9.30	9.13	6.2	8.5	3.1	28.5
	550	.4165	4.82	1.98	23.32	1.20	12.48	13.34	6.3	8.3	4.4	40.6
	650	.4261	7.40	3.08	28.61	1.50	17.52	20.25	6.6	8.3	6.4	60.0
	750	.4399	9.36	4.54	37.72	1.73	25.36	29.99	7.9	9.7	9.3	88.5
	850	.4627	11.47	6.69	46.27	2.01	31.74	36.71	8.8	10.7	11.2	108.5
	950	.4821	12.15	8.27	46.22	1.69	30.78	37.65	8.5	10.2	11.1	109.5
2	50	.3897	.16	.08	2.82	.24	1.29	.72	3.3	5.3	.4	3.5
	150	.3943	.24	.16	5.21	.33	2.28	1.63	4.6	7.4	.8	6.4
	250	.3990	.74	.33	9.23	.58	4.20	3.46	5.4	8.1	1.4	12.0
	350	.4041	2.00	.83	15.36	.83	7.68	7.18	5.9	8.3	2.5	22.7
	450	.4098	4.40	1.86	23.20	1.19	12.95	13.21	6.4	8.6	4.4	40.7
	550	.4168	7.66	3.27	32.47	1.55	20.41	21.53	7.2	9.1	6.9	65.6
	650	.4263	10.92	5.37	44.30	1.85	30.12	31.88	8.4	10.3	9.9	96.9
	750	.4400	10.82	7.64	56.82	2.09	40.36	39.27	10.2	12.6	12.3	122.3
	850	.4628	11.19	10.14	63.68	2.10	45.32	44.37	11.0	13.5	13.7	137.6
	950	.4821	11.85	10.86	58.07	1.49	41.14	43.23	10.2	12.2	13.2	131.4
3	50	.3902	.24	.08	2.82	.24	1.37	.81	2.7	4.4	.5	3.7
	150	.3948	.41	.16	5.38	.41	2.61	1.88	4.1	6.4	.8	7.0
	250	.3995	1.07	.41	9.99	.66	5.12	4.29	5.0	7.4	1.6	13.9
	350	.4045	2.67	1.09	17.38	.92	9.78	8.94	6.0	8.2	3.1	28.5
	450	.4101	5.34	2.29	27.88	1.36	17.37	16.52	7.1	9.2	5.5	52.0
	550	.4171	8.45	4.22	41.28	1.72	27.84	26.46	8.5	10.8	8.6	83.9
	650	.4264	10.48	6.96	57.00	2.03	40.17	38.15	10.3	12.8	12.0	119.7
	750	.4401	10.37	10.18	70.93	2.18	51.38	46.65	12.0	14.9	14.6	148.2
	850	.4629	10.71	12.72	76.03	2.10	55.18	51.55	12.6	15.3	16.0	162.2
	950	.4821	11.55	12.75	66.84	1.39	48.81	48.11	11.4	13.5	14.8	148.8

PREDICTED ION CONCENTRATIONS, ESP, SAR, EC, AND DISSOLVED CATIONS OF THE SOIL PROFILE FOR TREATMENT NO. 32 (WATER TABLE DEPTH 1000 MM; WATER TABLE EC 6 DS/M; CLAY LOAM SOIL; WHEAT CROP; 04 DAYS IRRIGATION INTERVAL WITH IRRIGATION APPLICATION AMOUNT AS 0.50 OF ET)

End of Year	Depth (mm)	Theta (cm3/cm3)	Ca	Mg	Na	K	Cl	SO4	ESP	SAR	EC (ds/m)	Diss. Cat. (meq/l)
			----------	----------	----------	mmol/l	----------	----------				
1	50	.3908	.40	.16	5.65	.40	2.42	1.86	4.4	6.9	.8	7.0
	150	.3954	.90	.41	10.21	.57	4.49	3.84	5.5	8.1	1.5	13.4
	250	.4001	1.98	.83	15.46	.83	7.36	6.78	6.0	8.3	2.4	22.0
	350	.4050	3.35	1.42	19.58	1.09	9.87	9.71	6.1	8.3	3.3	30.5
	450	.4106	4.84	2.04	23.16	1.27	12.64	13.32	6.2	8.1	4.3	40.5
	550	.4174	7.24	3.02	28.20	1.47	18.37	20.09	6.5	8.2	6.4	60.5
	650	.4266	8.64	4.14	37.90	1.67	29.79	30.41	8.1	10.0	9.9	93.9
	750	.4402	10.91	6.64	53.39	2.00	42.29	37.74	9.9	12.3	12.4	121.1
	850	.4629	11.38	9.28	60.54	2.10	44.09	42.08	10.6	13.1	13.2	131.7
	950	.4821	12.05	9.96	51.50	1.59	34.96	40.14	9.1	10.9	11.9	118.9
2	50	.3910	.73	.32	6.62	.48	3.31	2.67	4.0	6.0	1.1	9.1
	150	.3957	1.80	.74	13.16	.82	6.95	6.13	5.2	7.4	2.2	19.9
	250	.4004	4.14	1.74	21.43	1.16	12.99	12.16	6.1	8.0	4.2	38.6
	350	.4053	6.95	2.93	29.39	1.42	21.02	20.35	6.8	8.5	6.8	64.1
	450	.4108	7.89	3.82	38.70	1.61	31.74	30.05	8.5	10.4	9.9	95.1
	550	.4176	10.01	5.61	51.94	1.81	45.56	38.91	10.0	12.3	13.0	126.7
	650	.4267	10.05	8.20	69.29	2.12	59.33	45.58	12.3	15.3	15.5	153.9
	750	.4403	10.01	12.19	83.24	2.37	65.32	53.13	13.6	16.9	17.3	175.3
	850	.4630	10.62	14.25	79.02	2.10	56.82	53.67	12.7	15.4	16.4	168.2
	950	.4821	11.65	12.65	59.96	1.29	41.14	45.72	10.2	12.0	13.5	136.3
3	50	.3911	1.21	.48	8.08	.57	5.33	4.28	3.8	5.5	1.7	14.4
	150	.3958	3.11	1.31	16.85	.98	12.27	10.30	5.4	7.2	3.8	33.9
	250	.4005	6.37	2.73	29.13	1.41	23.67	20.19	7.0	8.9	7.1	66.0
	350	.4054	8.79	4.44	43.81	1.68	38.36	31.66	9.0	11.1	11.0	104.9
	450	.4108	9.68	6.03	59.33	1.87	54.58	42.01	11.2	13.9	14.6	141.9
	550	.4176	9.49	8.80	77.91	2.16	70.32	50.65	13.5	17.1	17.6	175.2
	650	.4268	9.26	13.32	96.21	2.47	81.13	60.40	15.3	19.1	20.2	206.0
	750	.4403	9.37	17.56	104.25	2.55	80.42	66.50	15.7	19.2	21.0	217.7
	850	.4630	10.24	17.89	91.17	2.10	65.15	61.80	14.0	16.6	18.4	192.9
	950	.4821	11.45	14.54	66.14	1.20	45.22	49.50	10.8	12.6	14.2	148.1

PREDICTED ION CONCENTRATIONS, ESP, SAR, EC, AND DISSOLVED CATIONS OF THE SOIL PROFILE FOR TREATMENT NO. 33 (WATER TABLE DEPTH 1500 MM; WATER TABLE EC 2 DS/M; SANDY LOAM SOIL; COTTON CROP; 14 DAYS IRRIGATION INTERVAL WITH IRRIGATION APPLICATION AMOUNT AS 0.75 OF ET)

End of Year	Depth (mm)	Theta (cm3/cm3)	Ca	Mg	Na	K	Cl	SO4	ESP	SAR	EC (ds/m)	Diss. Cat. (meq/l)
			mmol/l									
1	75	.3133	.06	.00	2.40	.13	.97	.58	3.8	6.4	.3	2.7
	225	.3196	.26	.13	4.75	.26	1.98	1.45	4.2	6.7	.7	5.7
	375	.3263	.81	.34	8.90	.47	3.91	3.37	4.7	6.9	1.3	11.6
	525	.3336	1.72	.76	13.10	.69	6.20	5.79	4.9	6.9	2.0	18.7
	675	.3412	2.54	1.06	15.51	.85	7.75	7.47	5.0	6.9	2.6	23.7
	825	.3487	2.74	1.15	16.07	.86	8.07	8.00	5.1	6.9	2.7	24.9
	975	.3576	2.66	1.11	15.89	.89	7.98	7.91	5.2	7.1	2.6	24.4
	1125	.3714	3.15	1.30	17.50	1.00	8.98	8.67	5.4	7.3	3.0	27.2
	1275	.3969	5.74	2.38	23.95	1.39	13.94	11.89	5.7	7.6	4.5	41.6
	1425	.4617	7.63	3.24	22.42	1.53	15.45	11.83	5.0	6.6	5.2	45.8
2	75	.3153	.07	.00	1.63	.13	.72	.33	3.1	5.3	.2	1.9
	225	.3212	.07	.00	2.26	.13	.93	.46	4.0	6.8	.3	2.6
	375	.3273	.14	.07	3.52	.20	1.49	.81	4.5	7.5	.5	4.0
	525	.3328	.28	.14	5.78	.34	2.48	1.65	4.8	7.6	.8	6.9
	675	.3386	.70	.28	9.09	.49	3.99	3.15	5.0	7.6	1.3	11.6
	825	.3456	1.50	.64	12.71	.71	6.00	5.14	5.2	7.4	1.9	17.6
	975	.3553	2.57	1.10	16.30	.88	8.15	7.34	5.3	7.3	2.7	24.4
	1125	.3703	4.21	1.76	20.66	1.15	11.25	10.10	5.5	7.3	3.7	33.8
	1275	.3967	7.46	3.11	27.13	1.56	16.72	14.02	5.7	7.5	5.4	49.9
	1425	.4616	10.97	4.77	29.28	1.81	21.08	16.69	5.5	7.2	6.9	62.7
3	75	.3269	.07	.07	2.03	.20	.95	.41	2.8	4.6	.3	2.4
	225	.3331	.07	.07	2.89	.21	1.24	.62	3.9	6.6	.4	3.4
	375	.3377	.14	.07	4.33	.28	1.88	.98	4.7	7.6	.6	5.0
	525	.3412	.35	.14	6.49	.35	2.82	1.69	4.9	7.8	.9	7.8
	675	.3447	.78	.36	9.61	.50	4.34	3.13	5.1	7.7	1.4	12.3
	825	.3494	1.73	.72	13.86	.72	6.71	5.41	5.3	7.4	2.2	19.6
	975	.3573	3.91	1.62	19.93	1.03	10.85	9.15	5.4	7.3	3.5	32.1
	1125	.3711	8.36	3.53	29.06	1.53	18.86	15.10	5.7	7.4	5.8	54.4
	1275	.3969	12.38	5.58	37.23	2.05	26.82	20.42	6.2	8.0	7.9	75.1
	1425	.4617	10.49	4.67	25.47	1.72	19.84	14.12	4.9	6.3	6.4	57.3

PREDICTED ION CONCENTRATIONS, ESP, SAR, EC, AND DISSOLVED CATIONS OF THE SOIL PROFILE FOR TREATMENT NO. 34 (WATER TABLE DEPTH 1500 MM; WATER TABLE EC 2 DS/M; SANDY LOAM SOIL; COTTON CROP; 14 DAYS IRRIGATION INTERVAL WITH IRRIGATION APPLICATION AMOUNT AS 0.50 OF ET)

End of Year	Depth (mm)	Theta (cm3/cm3)	Ca	Mg	Na	K	Cl	SO4	ESP	SAR	EC (ds/m)	Diss. Cat. (meq/l)
			mmol/l									
1	75	.2945	.49	.18	6.02	.37	2.62	2.13	3.8	5.8	.9	7.7
	225	.3035	1.32	.56	10.60	.56	5.02	4.51	4.3	6.1	1.6	14.9
	375	.3115	2.45	1.03	14.61	.77	7.40	7.08	4.6	6.3	2.4	22.7
	525	.3192	2.64	1.12	15.23	.86	7.72	7.58	4.7	6.3	2.6	24.0
	675	.3276	2.30	.95	14.28	.81	7.04	7.04	4.7	6.5	2.4	21.7
	825	.3375	2.09	.91	13.88	.77	6.76	6.76	4.8	6.7	2.2	20.6
	975	.3501	2.46	1.01	15.19	.87	7.60	7.45	5.0	6.9	2.5	23.1
	1125	.3678	4.86	2.05	21.35	1.22	12.16	10.71	5.3	7.1	3.9	36.3
	1275	.3962	10.81	4.58	32.58	1.88	22.10	16.54	5.8	7.5	7.0	65.2
	1425	.4613	8.58	3.72	20.30	1.62	15.92	10.67	4.2	5.6	5.3	46.7
2	75	.3123	.13	.06	3.16	.19	1.36	.84	3.5	5.6	.5	3.7
	225	.3180	.46	.20	6.50	.39	2.89	2.10	4.3	6.6	.9	8.2
	375	.3240	1.34	.60	11.78	.67	5.56	4.62	4.8	6.9	1.8	16.3
	525	.3298	2.73	1.16	16.56	.89	8.45	7.63	5.0	7.0	2.7	25.2
	675	.3361	3.68	1.53	18.61	.97	9.93	9.37	5.1	6.8	3.2	30.0
	825	.3437	4.19	1.70	19.60	1.07	10.72	10.08	5.1	6.8	3.5	32.5
	975	.3541	5.85	2.41	23.19	1.24	13.83	11.93	5.2	6.9	4.4	41.1
	1125	.3698	10.16	4.28	31.17	1.68	21.62	15.89	5.5	7.2	6.6	61.7
	1275	.3966	14.26	6.47	37.37	2.21	29.09	19.01	5.7	7.5	8.6	80.9
	1425	.4615	13.25	5.91	26.32	1.91	23.74	14.78	4.5	5.8	7.3	66.6
3	75	.3217	.40	.13	4.72	.33	2.19	1.40	3.4	5.3	.7	6.1
	225	.3270	.95	.34	8.18	.47	3.92	2.84	4.3	5.9	1.3	11.1
	375	.3307	1.78	.75	13.53	.75	6.63	5.40	4.9	7.0	2.1	19.4
	525	.3338	3.24	1.38	18.14	.97	9.52	8.35	5.2	7.1	3.0	28.2
	675	.3376	4.67	1.95	21.20	1.12	11.93	10.60	5.2	6.9	3.8	35.5
	825	.3439	6.61	2.77	24.66	1.28	15.35	12.93	5.2	6.8	4.8	44.7
	975	.3539	10.02	4.24	31.00	1.61	22.89	16.60	5.5	7.0	6.5	61.1
	1125	.3696	12.68	6.19	40.47	1.99	34.52	19.17	6.3	8.2	8.5	80.1
	1275	.3966	15.81	8.03	42.94	2.54	37.53	18.36	6.1	7.9	9.8	93.2
	1425	.4615	11.16	5.24	22.98	1.72	21.17	11.82	4.2	5.5	6.3	57.4

PREDICTED ION CONCENTRATIONS, ESP, SAR, EC, AND DISSOLVED CATIONS OF THE SOIL PROFILE FOR TREATMENT NO. 35 (WATER TABLE DEPTH 1500 MM; WATER TABLE EC 2 DS/M; SANDY LOAM SOIL; COTTON CROP; 04 DAYS IRRIGATION INTERVAL WITH IRRIGATION APPLICATION AMOUNT AS 0.75 OF ET)

End of Year	Depth (mm)	Theta (cm3/cm3)	Ca	Mg	Na	K	Cl	SO4	ESP	SAR	EC (ds/m)	Diss. Cat. (meq/l)
			mmol/l									
1	75	.3241	.33	.13	5.02	.33	2.21	1.47	4.0	6.2	.7	6.2
	225	.3270	1.76	.74	13.17	.74	6.42	5.47	4.9	6.8	2.1	19.0
	375	.3244	3.42	1.41	17.63	.94	9.32	8.78	4.9	6.6	3.0	28.3
	525	.3243	2.68	1.14	15.34	.87	7.84	7.71	4.7	6.4	2.6	24.1
	675	.3297	2.04	.82	13.35	.75	6.47	6.47	4.7	6.5	2.2	19.9
	825	.3388	1.89	.77	13.09	.70	6.30	6.23	4.8	6.7	2.1	19.2
	975	.3512	2.10	.87	14.15	.80	6.89	6.82	5.0	7.0	2.3	21.0
	1125	.3686	3.20	1.37	17.52	.99	9.22	8.53	5.3	7.2	3.0	27.6
	1275	.3964	5.81	2.46	23.83	1.39	14.09	11.38	5.7	7.5	4.6	41.6
	1425	.4614	6.10	2.57	18.78	1.43	12.77	9.06	4.6	6.2	4.4	37.7
2	75	.3302	.27	.14	3.82	.27	1.77	1.02	3.3	5.3	.6	4.8
	225	.3292	1.16	.48	10.81	.61	5.17	3.74	4.8	6.9	1.7	14.8
	375	.3246	3.42	1.41	19.18	.94	10.19	8.45	5.2	7.1	3.2	29.8
	525	.3254	4.30	1.82	20.10	1.08	11.16	10.08	5.0	6.7	3.5	33.3
	675	.3313	3.49	1.44	17.59	.96	9.45	8.97	4.9	6.5	3.1	28.5
	825	.3402	3.09	1.27	16.73	.91	8.72	8.29	4.9	6.7	2.9	26.4
	975	.3521	3.78	1.60	18.70	1.02	10.18	9.17	5.1	6.9	3.3	30.6
	1125	.3690	5.87	2.44	23.18	1.30	13.80	11.21	5.3	7.0	4.5	41.0
	1275	.3964	8.52	3.60	26.45	1.64	17.69	13.02	5.2	6.9	5.8	52.3
	1425	.4614	9.25	4.00	21.54	1.62	16.87	11.63	4.4	5.7	5.6	49.7
3	75	.3355	.69	.28	5.41	.42	2.84	1.66	3.1	4.7	1.0	7.8
	225	.3191	1.78	.79	12.59	.73	6.53	4.55	4.5	6.5	2.1	18.5
	375	.3146	3.57	1.49	19.63	.97	10.59	8.45	5.1	7.0	3.3	30.8
	525	.3203	4.43	1.85	20.91	1.06	11.65	10.19	5.1	6.8	3.7	34.6
	675	.3283	4.34	1.83	19.74	1.09	11.06	10.04	5.0	6.6	3.5	33.1
	825	.3383	4.68	1.96	20.41	1.12	11.60	10.27	5.0	6.6	3.7	34.7
	975	.3510	6.67	2.83	24.44	1.38	15.01	12.26	5.1	6.7	4.8	44.8
	1125	.3685	10.81	4.49	30.68	1.75	21.39	15.84	5.3	6.9	6.8	63.1
	1275	.3964	13.02	5.57	32.19	2.05	24.73	16.71	5.2	6.8	7.7	71.4
	1425	.4614	9.53	4.19	20.11	1.62	16.78	11.06	4.0	5.2	5.6	49.1

PREDICTED ION CONCENTRATIONS, ESP, SAR, EC, AND DISSOLVED CATIONS OF THE SOIL PROFILE FOR TREATMENT NO. 36 (WATER TABLE DEPTH 1500 MM; WATER TABLE EC 2 DS/M; SANDY LOAM SOIL; COTTON CROP; 04 DAYS IRRIGATION INTERVAL WITH IRRIGATION APPLICATION AMOUNT AS 0.50 OF ET)

End of Year	Depth (mm)	Theta (cm3/cm3)	Ca	Mg	Na	K	Cl	SO4	ESP	SAR	EC (ds/m)	Diss. Cat. (meq/l)
			mmol/l									
1	75	.3162	.98	.39	8.95	.52	4.18	3.40	4.2	6.1	1.4	12.2
	225	.3183	2.83	1.18	15.85	.85	8.22	7.63	4.7	6.4	2.7	24.7
	375	.3187	2.57	1.05	14.82	.79	7.57	7.37	4.6	6.3	2.5	23.4
	525	.3222	1.86	.80	12.71	.73	6.12	6.12	4.6	6.4	2.1	19.0
	675	.3290	1.70	.68	12.30	.68	5.85	5.85	4.7	6.5	2.0	17.9
	825	.3384	1.82	.77	12.86	.70	6.15	6.08	4.8	6.7	2.0	18.7
	975	.3510	2.47	1.02	15.08	.87	7.54	7.25	5.0	6.9	2.5	22.8
	1125	.3685	5.03	2.13	21.77	1.22	12.49	10.81	5.3	7.1	4.0	37.3
	1275	.3964	10.24	4.34	31.53	1.80	21.21	15.72	5.7	7.5	6.8	62.4
	1425	.4614	8.39	3.62	19.83	1.62	15.44	10.39	4.2	5.5	5.2	45.5
2	75	.3063	.89	.38	7.85	.51	3.80	2.78	3.7	5.6	1.2	10.8
	225	.3114	3.02	1.29	16.86	.90	8.94	7.53	4.8	6.6	2.9	26.4
	375	.3173	4.00	1.64	18.95	.98	10.42	9.51	4.9	6.4	3.3	31.3
	525	.3239	3.08	1.27	16.20	.87	8.50	8.16	4.7	6.4	2.8	25.8
	675	.3316	2.67	1.10	15.28	.82	7.81	7.54	4.7	6.5	2.6	23.8
	825	.3406	3.66	1.55	17.80	.99	9.71	8.73	4.9	6.5	3.2	29.1
	975	.3524	6.41	2.69	23.66	1.31	14.71	11.87	5.1	6.7	4.7	43.1
	1125	.3691	10.60	4.50	31.34	1.75	22.88	16.62	5.5	7.1	6.8	63.1
	1275	.3965	12.37	5.82	34.33	2.13	27.94	18.76	5.7	7.3	7.8	72.8
	1425	.4614	11.34	5.15	22.21	1.72	20.59	13.44	4.1	5.3	6.3	56.8
3	75	.3239	2.07	.87	11.31	.74	6.29	4.68	4.0	5.6	2.2	18.0
	225	.3125	3.87	1.61	18.92	.97	10.52	8.72	4.8	6.5	3.4	30.9
	375	.3138	4.28	1.82	19.90	1.04	11.09	9.85	4.9	6.5	3.5	33.1
	525	.3202	3.84	1.59	18.13	.99	9.99	9.13	4.7	6.3	3.2	30.0
	675	.3283	4.27	1.76	18.86	1.02	10.79	9.50	4.7	6.3	3.5	32.0
	825	.3382	6.50	2.73	23.20	1.26	15.02	11.88	4.9	6.4	4.6	42.8
	975	.3510	10.44	4.42	30.68	1.67	23.21	15.81	5.3	6.7	6.6	62.0
	1125	.3685	13.63	6.32	39.06	2.06	33.65	17.74	5.9	7.6	8.6	80.9
	1275	.3964	15.40	7.86	39.48	2.46	34.97	18.35	5.7	7.4	9.4	88.5
	1425	.4614	10.68	5.05	21.16	1.62	19.92	11.44	3.9	5.2	6.0	54.1

PREDICTED ION CONCENTRATIONS, ESP, SAR, EC, AND DISSOLVED CATIONS OF THE SOIL PROFILE FOR TREATMENT NO. 37 (WATER TABLE DEPTH 1500 MM; WATER TABLE EC 2 DS/M; SANDY LOAM SOIL; WHEAT CROP; 14 DAYS IRRIGATION INTERVAL WITH IRRIGATION APPLICATION AMOUNT AS 0.75 OF ET)

End of Year	Depth (mm)	Theta (cm3/cm3)	Ca	Mg	Na	K	Cl	SO4	ESP	SAR	EC (ds/m)	Diss. Cat. (meq/l)
			mmol/l									
1	75	.3517	.07	.00	2.03	.15	.87	.44	4.1	7.0	.3	2.3
	225	.3601	.15	.07	3.87	.22	1.56	1.04	4.8	7.9	.5	4.5
	375	.3629	.52	.22	7.57	.45	3.22	2.70	5.2	7.9	1.1	9.4
	525	.3586	1.41	.59	12.30	.67	5.63	5.19	5.3	7.5	1.9	17.0
	675	.3491	2.38	1.01	15.29	.79	7.50	7.21	5.2	7.1	2.5	23.0
	825	.3454	2.71	1.14	16.06	.86	8.06	7.92	5.1	6.9	2.7	24.8
	975	.3530	2.70	1.17	16.12	.88	8.10	8.02	5.1	7.0	2.7	24.9
	1125	.3691	3.28	1.37	17.92	.99	9.30	9.00	5.3	7.2	3.0	28.3
	1275	.3965	6.31	2.62	25.31	1.39	14.91	12.86	5.8	7.7	4.8	44.6
	1425	.4614	8.29	3.53	23.55	1.62	16.49	12.68	5.1	6.7	5.5	48.9
2	75	.3521	.07	.00	1.82	.15	.80	.36	3.5	5.9	.3	2.0
	225	.3608	.07	.00	2.91	.15	1.19	.60	4.6	7.7	.4	3.3
	375	.3642	.23	.08	5.12	.30	2.18	1.35	5.1	8.2	.7	6.0
	525	.3609	.67	.30	8.80	.45	3.88	2.98	5.3	8.0	1.3	11.1
	675	.3524	1.46	.66	12.81	.66	5.97	5.17	5.3	7.6	2.0	17.8
	825	.3479	2.52	1.08	16.03	.86	7.98	7.33	5.2	7.3	2.6	23.9
	975	.3543	3.59	1.46	18.89	1.02	9.96	9.22	5.3	7.2	3.2	30.0
	1125	.3696	5.65	2.37	23.44	1.30	13.52	11.99	5.5	7.3	4.4	40.7
	1275	.3965	10.24	4.34	31.62	1.80	20.97	16.79	5.8	7.5	6.7	62.6
	1425	.4615	12.20	5.34	28.03	1.81	21.84	16.21	5.1	6.5	7.1	64.8
3	75	.3523	.07	.00	1.67	.15	.73	.36	3.0	4.9	.3	2.0
	225	.3612	.07	.00	2.61	.15	1.12	.52	4.3	7.3	.4	3.0
	375	.3651	.15	.08	4.30	.23	1.81	.98	5.1	8.3	.6	5.0
	525	.3629	.37	.15	7.12	.37	3.07	2.02	5.3	8.2	1.0	8.7
	675	.3552	.95	.44	10.79	.59	4.92	3.67	5.4	7.9	1.6	14.2
	825	.3502	2.03	.87	14.76	.80	7.24	5.93	5.3	7.5	2.4	21.2
	975	.3555	3.67	1.54	19.46	1.03	10.43	8.81	5.4	7.3	3.4	30.9
	1125	.3700	6.80	2.83	26.07	1.38	15.90	13.07	5.6	7.3	5.0	46.7
	1275	.3966	11.88	5.33	35.56	1.97	24.99	19.58	6.1	7.8	7.6	71.9
	1425	.4615	13.73	6.10	30.99	1.91	25.65	18.50	5.3	6.8	7.9	72.7

PREDICTED ION CONCENTRATIONS, ESP, SAR, EC, AND DISSOLVED CATIONS OF THE SOIL PROFILE FOR TREATMENT NO. 38 (WATER TABLE DEPTH 1500 MM; WATER TABLE EC 2 DS/M; SANDY LOAM SOIL; WHEAT CROP; 14 DAYS IRRIGATION INTERVAL WITH IRRIGATION APPLICATION AMOUNT AS 0.50 OF ET)

End of Year	Depth (mm)	Theta (cm3/cm3)	Ca	Mg	Na	K	Cl	SO4	ESP	SAR	EC (ds/m)	Diss. Cat. (meq/l)
			----------	----------	----------	mmol/l	----------	----------				
1	75	.3446	.14	.07	3.99	.28	1.64	1.21	4.3	6.8	.6	4.8
	225	.3495	.72	.29	8.59	.51	3.75	3.25	4.8	7.2	1.3	11.1
	375	.3460	1.93	.79	13.87	.79	6.65	6.29	5.1	7.1	2.2	20.3
	525	.3368	2.71	1.11	15.80	.84	8.00	7.79	4.9	6.7	2.7	24.8
	675	.3334	2.48	1.03	15.02	.83	7.51	7.44	4.8	6.6	2.5	23.1
	825	.3394	2.24	.91	14.31	.77	7.01	7.01	4.9	6.7	2.3	21.5
	975	.3512	2.54	1.09	15.46	.87	7.69	7.55	5.1	7.0	2.5	23.5
	1125	.3686	4.87	2.06	21.55	1.22	12.26	10.89	5.3	7.2	4.0	36.7
	1275	.3964	10.97	4.67	33.42	1.88	22.52	17.12	5.9	7.6	7.2	66.6
	1425	.4614	9.63	4.19	22.02	1.72	17.45	11.82	4.4	5.8	5.8	51.4
2	75	.3453	.14	.07	3.78	.29	1.64	1.07	3.9	6.3	.5	4.6
	225	.3505	.72	.29	8.26	.51	3.69	2.90	4.7	7.1	1.2	10.8
	375	.3476	1.94	.79	14.29	.79	6.97	6.03	5.2	7.3	2.3	20.6
	525	.3387	3.15	1.33	17.77	.91	9.24	8.61	5.2	7.0	3.0	27.8
	675	.3348	3.53	1.45	18.19	.97	9.62	9.27	5.0	6.7	3.1	29.3
	825	.3403	4.01	1.69	18.91	1.05	10.34	9.63	5.0	6.7	3.4	31.3
	975	.3517	6.03	2.54	23.25	1.31	13.95	11.84	5.2	6.8	4.5	41.6
	1125	.3687	10.82	4.57	31.92	1.75	22.70	16.76	5.6	7.1	6.9	64.3
	1275	.3964	14.01	6.63	39.31	2.21	32.35	19.57	6.1	7.9	8.8	82.8
	1425	.4614	11.73	5.24	22.88	1.72	20.78	13.16	4.2	5.4	6.5	58.5
3	75	.3456	.21	.07	3.71	.29	1.64	1.00	3.6	5.9	.5	4.6
	225	.3511	.80	.36	8.34	.51	3.84	2.83	4.6	6.8	1.3	11.1
	375	.3486	2.16	.94	15.13	.79	7.49	6.19	5.3	7.3	2.5	22.0
	525	.3401	3.86	1.62	20.03	1.05	10.75	9.42	5.3	7.2	3.4	31.9
	675	.3359	5.14	2.15	22.14	1.18	12.63	11.31	5.2	6.9	4.0	37.8
	825	.3410	6.76	2.82	24.66	1.34	15.36	13.03	5.1	6.7	4.8	45.1
	975	.3521	9.75	4.07	29.90	1.60	21.32	16.22	5.4	6.8	6.3	59.1
	1125	.3689	12.12	5.72	37.58	1.91	31.33	19.44	6.1	7.8	7.9	75.2
	1275	.3964	15.56	8.11	43.24	2.54	38.90	18.67	6.1	8.0	9.8	93.0
	1425	.4614	12.49	5.82	24.21	1.72	22.88	13.25	4.2	5.5	6.9	62.6

PREDICTED ION CONCENTRATIONS, ESP, SAR, EC, AND DISSOLVED CATIONS OF THE SOIL PROFILE FOR TREATMENT NO. 39 (WATER TABLE DEPTH 1500 MM; WATER TABLE EC 2 DS/M; SANDY LOAM SOIL; WHEAT CROP; 04 DAYS IRRIGATION INTERVAL WITH IRRIGATION APPLICATION AMOUNT AS 0.75 OF ET)

End of Year	Depth (mm)	Theta (cm3/cm3)	Ca	Mg	Na	K	Cl	SO4	ESP	SAR	EC (ds/m)	Diss. Cat. (meq/l)
			mmol/l									
1	75	.3290	.14	.07	2.72	.14	1.77	1.09	4.1	5.5	1.8	16.6
	225	.3303	1.16	.48	10.78	.61	5.12	4.16	4.8	6.9	1.7	15.1
	375	.3267	2.90	1.22	16.67	.88	8.57	7.97	5.0	6.8	2.8	25.9
	525	.3264	2.76	1.15	15.71	.88	8.03	7.89	4.8	6.5	2.7	24.9
	675	.3312	2.12	.89	13.82	.75	6.77	6.71	4.7	6.6	2.3	20.8
	825	.3397	1.97	.84	13.41	.77	6.46	6.39	4.8	6.7	2.1	19.7
	975	.3516	2.11	.87	14.24	.80	6.90	6.83	5.0	7.0	2.3	21.1
	1125	.3688	3.05	1.30	17.30	.99	8.92	8.53	5.3	7.2	2.9	27.0
	1275	.3964	5.65	2.38	23.83	1.31	13.92	11.63	5.7	7.6	4.5	41.2
	1425	.4614	6.20	2.67	19.35	1.43	13.06	9.44	4.7	6.4	4.4	38.4
2	75	.3332	.41	.21	4.89	.34	1.86	1.03	3.3	5.1	.7	6.5
	225	.3361	1.11	.49	11.32	.56	5.69	4.24	5.3	7.6	2.0	18.3
	375	.3334	2.69	1.17	17.22	.83	10.40	8.89	5.5	7.3	3.4	31.3
	525	.3317	3.56	1.51	18.23	.96	10.42	9.66	5.1	6.7	3.4	31.9
	675	.3347	3.04	1.24	16.46	.90	8.64	8.37	4.9	6.6	2.8	26.4
	825	.3418	2.90	1.20	16.17	.92	8.33	7.98	4.9	6.7	2.7	25.2
	975	.3528	3.72	1.53	18.59	1.02	10.06	9.04	5.1	6.9	3.3	30.1
	1125	.3692	5.87	2.44	23.42	1.30	13.96	11.37	5.3	7.1	4.5	41.4
	1275	.3965	9.34	3.93	28.18	1.72	19.09	14.01	5.3	7.0	6.2	56.4
	1425	.4615	8.58	3.72	20.12	1.62	15.73	10.68	4.2	5.5	5.3	46.4
3	75	.3364	.28	.14	3.89	.35	1.88	1.04	3.1	4.8	.6	5.1
	225	.3404	1.41	.63	12.38	.70	6.05	4.22	5.1	7.4	2.0	18.2
	375	.3385	3.08	1.33	19.79	.91	11.89	9.51	5.9	7.9	3.7	34.0
	525	.3358	3.12	1.32	19.08	.90	12.84	11.24	5.8	7.6	4.2	38.4
	675	.3372	4.04	1.67	19.23	1.05	11.22	10.24	5.1	6.7	3.6	33.4
	825	.3432	4.40	1.84	19.85	1.06	11.27	10.00	5.0	6.7	3.6	33.4
	975	.3535	5.84	2.48	23.01	1.24	13.73	11.32	5.1	6.8	4.4	40.9
	1125	.3695	8.78	3.66	27.48	1.60	18.25	13.74	5.2	6.8	5.9	53.9
	1275	.3965	12.21	5.24	30.39	1.97	22.77	15.89	5.1	6.6	7.3	67.3
	1425	.4615	10.20	4.58	21.17	1.62	17.83	11.82	4.0	5.3	5.9	52.3

PREDICTED ION CONCENTRATIONS, ESP, SAR, EC, AND DISSOLVED CATIONS OF THE SOIL PROFILE FOR TREATMENT NO. 40 (WATER TABLE DEPTH 1500 MM; WATER TABLE EC 2 DS/M; SANDY LOAM SOIL; WHEAT CROP; 04 DAYS IRRIGATION INTERVAL WITH IRRIGATION APPLICATION AMOUNT AS 0.50 OF ET)

End of Year	Depth (mm)	Theta (cm3/cm3)	Ca	Mg	Na	K	Cl	SO4	ESP	SAR	EC (ds/m)	Diss. Cat. (meq/l)
			mmol/l									
1	75	.3302	.55	.20	6.62	.41	3.00	2.18	4.2	6.3	1.0	8.5
	225	.3306	1.98	.82	13.73	.75	6.69	6.08	4.8	6.8	2.2	20.2
	375	.3246	2.55	1.07	15.02	.80	7.58	7.38	4.8	6.4	2.6	23.6
	525	.3234	2.00	.87	13.23	.74	6.41	6.41	4.6	6.4	2.2	20.0
	675	.3288	1.77	.75	12.64	.68	6.05	6.05	4.7	6.5	2.0	18.5
	825	.3381	1.89	.77	13.13	.77	6.29	6.29	4.8	6.7	2.1	19.3
	975	.3508	2.46	1.01	15.22	.87	7.61	7.39	5.0	6.9	2.5	23.1
	1125	.3684	5.02	2.06	21.77	1.22	12.41	10.96	5.3	7.2	4.0	37.2
	1275	.3963	10.48	4.42	32.42	1.80	21.70	16.46	5.8	7.6	6.9	64.1
	1425	.4614	8.68	3.72	20.40	1.62	15.92	10.68	4.2	5.6	5.3	46.9
2	75	.3312	.82	.34	7.60	.48	3.63	2.60	4.0	5.9	1.2	10.4
	225	.3319	2.88	1.23	16.80	.89	8.78	7.47	5.0	6.9	2.8	25.9
	375	.3260	3.57	1.48	18.12	.94	9.70	8.96	4.9	6.6	3.1	29.1
	525	.3242	2.68	1.14	15.34	.87	7.84	7.64	4.8	6.4	2.6	24.0
	675	.3294	2.59	1.09	14.97	.82	7.55	7.28	4.8	6.5	2.5	23.1
	825	.3385	3.57	1.47	17.55	.98	9.51	8.60	4.8	6.6	3.1	28.6
	975	.3511	6.17	2.61	23.36	1.31	14.22	11.75	5.1	6.7	4.6	42.2
	1125	.3685	10.74	4.49	31.60	1.75	22.69	16.75	5.5	7.1	6.8	63.9
	1275	.3964	13.10	6.14	36.45	2.13	30.22	20.31	5.9	7.5	8.2	77.2
	1425	.4614	10.30	4.58	20.21	1.62	18.02	11.63	3.9	5.1	5.8	51.7
3	75	.3315	1.03	.41	8.42	.55	4.18	3.01	3.8	5.7	1.4	11.9
	225	.3324	3.91	1.65	19.50	1.03	10.78	8.86	5.2	6.9	3.5	31.6
	375	.3264	4.86	2.02	21.72	1.15	12.34	10.92	5.1	6.7	3.9	36.7
	525	.3245	4.02	1.68	18.84	1.01	10.46	9.59	4.8	6.4	3.3	31.3
	675	.3296	4.43	1.84	19.27	1.09	11.10	9.74	4.8	6.3	3.6	32.9
	825	.3387	6.51	2.73	23.37	1.26	14.98	12.04	4.9	6.4	4.7	43.2
	975	.3511	10.01	4.21	29.74	1.60	21.69	15.74	5.2	6.7	6.4	59.8
	1125	.3686	13.10	5.86	36.56	1.98	30.31	18.05	5.7	7.3	8.1	76.5
	1275	.3964	15.56	7.78	39.15	2.46	34.97	18.18	5.7	7.4	9.4	88.1
	1425	.4614	10.87	5.05	20.69	1.62	19.26	11.73	3.8	5.1	6.0	54.1

PREDICTED ION CONCENTRATIONS, ESP, SAR, EC, AND DISSOLVED CATIONS OF THE SOIL PROFILE FOR TREATMENT NO. 41 (WATER TABLE DEPTH 1500 MM; WATER TABLE EC 2 DS/M; CLAY LOAM SOIL; COTTON CROP; 14 DAYS IRRIGATION INTERVAL WITH IRRIGATION APPLICATION AMOUNT AS 0.75 OF ET)

End of Year	Depth (mm)	Theta (cm3/cm3)	Ca	Mg	Na	K	Cl	SO4	ESP	SAR	EC (ds/m)	Diss. Cat. (meq/l)
			mmol/l									
1	75	.3674	.08	.00	2.73	.15	1.14	.68	4.6	7.6	.4	3.1
	225	.3719	.23	.08	4.99	.31	2.07	1.54	4.9	7.8	.7	5.9
	375	.3767	.62	.31	8.56	.47	3.66	3.19	5.3	7.9	1.2	10.9
	525	.3823	1.34	.55	12.32	.71	5.61	5.21	5.5	7.9	1.8	16.8
	675	.3889	2.01	.88	14.95	.80	7.07	6.83	5.6	7.9	2.4	21.6
	825	.3969	2.46	1.07	16.48	.90	8.04	7.87	5.7	8.0	2.7	24.6
	975	.4072	2.94	1.26	17.84	1.01	8.92	8.75	5.8	8.0	2.9	27.2
	1125	.4213	4.00	1.65	20.80	1.13	11.05	10.27	6.0	8.1	3.6	33.4
	1275	.4437	6.42	2.66	25.03	1.56	14.94	12.65	6.0	8.0	4.9	44.6
	1425	.4789	7.52	3.27	21.27	1.48	14.94	11.58	4.8	6.4	5.1	44.4
2	75	.3687	.08	.00	1.75	.15	.76	.38	3.7	6.3	.3	2.1
	225	.3730	.08	.00	2.31	.15	1.00	.46	4.5	7.8	.3	2.6
	375	.3779	.08	.00	3.28	.16	1.33	.78	5.1	8.5	.4	3.7
	525	.3835	.16	.08	4.91	.32	2.06	1.43	5.4	8.7	.7	5.7
	675	.3899	.40	.16	7.33	.40	3.06	2.34	5.6	8.6	1.0	8.9
	825	.3977	.90	.33	10.44	.58	4.60	3.86	5.8	8.5	1.5	13.5
	975	.4077	1.85	.76	14.74	.84	6.99	6.06	5.9	8.3	2.3	20.8
	1125	.4216	3.83	1.66	20.56	1.13	10.98	9.41	6.0	8.2	3.6	32.8
	1275	.4438	6.88	2.93	26.13	1.56	15.86	13.11	6.1	8.1	5.2	47.2
	1425	.4789	9.10	4.06	25.82	1.58	18.01	14.25	5.4	7.1	6.0	53.6
3	75	.3772	.08	.00	2.10	.16	.94	.39	3.3	5.5	.3	2.5
	225	.3819	.08	.00	2.76	.16	1.18	.55	4.4	7.5	.4	3.2
	375	.3862	.08	.08	3.83	.24	1.60	.88	5.1	8.5	.5	4.3
	525	.3907	.24	.08	5.25	.32	2.26	1.37	5.4	8.8	.7	6.1
	675	.3956	.41	.16	7.60	.41	3.27	2.29	5.6	8.7	1.1	9.2
	825	.4017	1.16	.50	11.54	.66	5.31	4.07	5.6	8.3	1.7	15.4
	975	.4101	3.14	1.36	18.22	1.02	9.57	7.54	5.7	8.0	3.2	28.1
	1125	.4227	6.99	2.97	27.07	1.57	16.42	12.66	6.0	8.0	5.4	48.5
	1275	.4442	10.00	4.31	31.11	1.93	20.83	15.51	6.0	7.9	6.8	61.7
	1425	.4790	9.30	4.16	23.26	1.58	17.52	12.47	4.8	6.2	5.8	51.9

PREDICTED ION CONCENTRATIONS, ESP, SAR, EC, AND DISSOLVED CATIONS OF THE SOIL PROFILE FOR TREATMENT NO. 42 (WATER TABLE DEPTH 1500 MM; WATER TABLE EC 2 DS/M; CLAY LOAM SOIL; COTTON CROP; 14 DAYS IRRIGATION INTERVAL WITH IRRIGATION APPLICATION AMOUNT AS 0.50 OF ET)

End of Year	Depth (mm)	Theta (cm3/cm3)	Ca	Mg	Na	K	Cl	SO4	ESP	SAR	EC (ds/m)	Diss. Cat. (meq/l)
			mmol/l									
1	75	.3619	.52	.22	7.48	.45	3.22	2.69	4.8	7.3	1.1	9.5
	225	.3672	1.44	.61	11.99	.68	5.54	5.16	5.2	7.3	1.8	16.7
	375	.3732	2.47	1.00	16.04	.85	7.86	7.56	5.5	7.6	2.6	24.1
	525	.3797	2.90	1.18	17.34	.94	8.71	8.55	5.6	7.6	2.9	26.8
	675	.3869	2.80	1.20	17.11	.96	8.55	8.47	5.6	7.7	2.8	26.2
	825	.3955	2.86	1.14	17.24	.98	8.58	8.50	5.7	7.8	2.8	26.2
	975	.4062	3.69	1.51	19.72	1.09	10.41	9.65	5.8	7.9	3.4	31.3
	1125	.4208	6.52	2.70	25.91	1.48	15.48	12.69	6.0	8.0	5.0	45.8
	1275	.4434	9.89	4.21	29.50	1.92	20.25	14.66	5.7	7.5	6.6	59.5
	1425	.4788	7.82	3.46	17.81	1.48	14.25	9.50	4.0	5.3	4.8	41.7
2	75	.3683	.15	.08	3.88	.23	1.67	1.07	4.2	6.8	.5	4.6
	225	.3726	.46	.23	7.16	.46	3.08	2.39	4.9	7.5	1.0	9.0
	375	.3775	1.25	.55	11.78	.62	5.38	4.60	5.5	7.9	1.8	15.9
	525	.3831	2.30	.95	16.23	.87	7.92	7.12	5.7	8.0	2.6	23.6
	675	.3896	3.46	1.45	19.72	1.05	10.22	9.42	5.9	8.0	3.3	30.7
	825	.3975	4.93	2.05	23.16	1.23	12.81	11.50	5.9	8.0	4.1	38.4
	975	.4076	7.50	3.12	28.04	1.52	17.01	14.32	6.0	7.9	5.5	50.8
	1125	.4216	11.50	4.79	33.71	1.92	23.00	17.68	6.0	7.8	7.4	68.3
	1275	.4438	14.12	6.05	33.93	2.29	25.95	18.52	5.6	7.2	8.3	76.6
	1425	.4789	13.06	5.84	25.33	1.78	21.97	15.04	4.5	5.7	7.2	64.8
3	75	.3756	.47	.16	5.67	.39	2.56	1.78	4.1	6.4	.9	7.3
	225	.3802	.94	.39	9.27	.55	4.32	3.30	4.8	7.1	1.4	12.5
	375	.3846	1.83	.79	14.06	.79	6.83	5.64	5.5	7.8	2.2	20.0
	525	.3891	3.22	1.37	19.05	1.05	9.81	8.36	5.8	8.0	3.2	29.1
	675	.3943	5.30	2.20	24.20	1.30	13.60	11.57	5.9	8.0	4.4	40.4
	825	.4007	8.44	3.48	30.14	1.57	19.04	15.40	6.0	7.9	6.0	55.6
	975	.4095	12.35	5.25	36.97	1.95	26.91	19.80	6.3	8.1	7.9	74.2
	1125	.4224	14.05	6.63	41.45	2.27	33.51	21.91	6.6	8.6	9.0	85.0
	1275	.4441	14.13	6.70	35.78	2.29	30.19	20.00	5.9	7.5	8.6	79.7
	1425	.4790	10.49	4.85	20.88	1.48	19.30	12.57	4.1	5.3	6.0	53.1

PREDICTED ION CONCENTRATIONS, ESP, SAR, EC, AND DISSOLVED CATIONS OF THE SOIL PROFILE FOR TREATMENT NO. 43 (WATER TABLE DEPTH 1500 MM; WATER TABLE EC 2 DS/M; CLAY LOAM SOIL; COTTON CROP; 04 DAYS IRRIGATION INTERVAL WITH IRRIGATION APPLICATION AMOUNT AS 0.75 OF ET)

End of Year	Depth (mm)	Theta (cm3/cm3)	Ca	Mg	Na	K	Cl	SO4	ESP	SAR	EC (ds/m)	Diss. Cat. (meq/l)
			mmol/l									
1	75	.3775	.23	.08	5.07	.31	2.18	1.48	4.5	7.2	.7	6.2
	225	.3820	1.42	.63	12.79	.71	5.92	5.05	5.5	8.0	1.9	17.5
	375	.3858	3.51	1.43	19.93	1.04	10.28	9.65	5.9	8.0	3.3	30.9
	525	.3887	3.85	1.61	20.32	1.12	10.60	10.36	5.8	7.8	3.5	32.6
	675	.3925	3.00	1.30	17.92	.97	9.00	8.92	5.7	7.8	3.0	27.7
	825	.3987	2.72	1.15	16.97	.91	8.40	8.24	5.7	7.9	2.8	25.5
	975	.4080	2.95	1.26	17.79	1.01	9.02	8.60	5.7	7.9	3.0	27.2
	1125	.4217	3.92	1.66	20.48	1.13	11.07	9.67	5.9	8.0	3.6	32.8
	1275	.4438	5.32	2.29	22.19	1.38	13.20	10.09	5.7	7.7	4.3	38.8
	1425	.4789	5.54	2.37	16.23	1.39	11.38	7.82	4.2	5.7	3.9	33.3
2	75	.3819	.24	.08	3.79	.32	1.74	1.03	3.8	6.1	.6	4.7
	225	.3853	.80	.32	9.63	.56	4.38	3.18	5.3	8.0	1.4	12.5
	375	.3871	2.72	1.20	18.88	.96	9.44	7.92	6.2	8.6	3.0	27.7
	525	.3889	4.90	2.09	24.67	1.21	13.34	12.05	6.3	8.4	4.2	39.9
	675	.3924	5.43	2.27	24.89	1.30	13.86	12.89	6.1	8.0	4.4	41.6
	825	.3986	5.19	2.14	23.80	1.32	13.26	12.19	5.9	7.9	4.3	39.8
	975	.4080	5.56	2.36	24.19	1.35	13.82	11.89	5.9	7.9	4.5	41.3
	1125	.4217	6.62	2.79	25.09	1.48	15.33	11.94	5.8	7.7	5.0	45.4
	1275	.4438	7.61	3.21	23.38	1.65	15.86	11.37	5.0	6.8	5.3	46.7
	1425	.4789	7.72	3.36	18.01	1.48	14.25	9.70	4.0	5.3	4.8	41.8
3	75	.3896	.64	.24	5.63	.48	2.82	1.77	3.5	5.4	1.0	7.9
	225	.3875	1.52	.64	12.33	.72	6.08	4.48	5.1	7.5	2.0	17.5
	375	.3829	3.48	1.50	20.96	1.11	10.92	8.86	6.1	8.4	3.5	31.9
	525	.3837	5.47	2.30	26.48	1.27	14.59	12.61	6.3	8.5	4.6	43.2
	675	.3890	6.59	2.73	28.13	1.45	16.15	14.31	6.3	8.2	5.1	48.3
	825	.3969	7.63	3.20	29.11	1.56	17.55	14.84	6.2	8.0	5.6	52.2
	975	.4072	9.17	3.79	30.79	1.68	19.69	15.48	6.0	7.8	6.3	58.4
	1125	.4214	10.88	4.61	30.91	1.92	21.59	15.67	5.6	7.3	7.0	63.7
	1275	.4437	10.54	4.49	25.94	1.93	19.62	13.48	4.9	6.4	6.5	57.8
	1425	.4789	7.82	3.46	16.52	1.39	13.85	9.10	3.6	4.8	4.7	40.6

PREDICTED ION CONCENTRATIONS, ESP, SAR, EC, AND DISSOLVED CATIONS OF THE SOIL PROFILE FOR TREATMENT NO. 44 (WATER TABLE DEPTH 1500 MM; WATER TABLE EC 2 DS/M; CLAY LOAM SOIL; COTTON CROP; 04 DAYS IRRIGATION INTERVAL WITH IRRIGATION APPLICATION AMOUNT AS 0.50 OF ET)

End of Year	Depth (mm)	Theta (cm3/cm3)	Ca	Mg	Na	K	Cl	SO4	ESP	SAR	EC (ds/m)	Diss. Cat. (meq/l)
			mmol/l									
1	75	.3728	1.00	.46	10.01	.62	4.62	3.85	4.9	7.2	1.5	13.5
	225	.3769	3.11	1.32	18.46	1.01	9.34	8.72	5.7	7.7	3.0	28.3
	375	.3810	3.46	1.42	18.89	1.02	9.76	9.53	5.6	7.6	3.2	30.1
	525	.3851	2.63	1.11	16.47	.88	8.12	8.04	5.6	7.6	2.7	25.0
	675	.3903	2.26	.97	15.56	.89	7.50	7.50	5.6	7.7	2.5	23.0
	825	.3975	2.55	1.07	16.51	.90	8.13	7.97	5.7	7.8	2.7	24.7
	975	.4075	3.79	1.60	19.79	1.09	10.61	9.60	5.8	7.8	3.4	31.7
	1125	.4215	6.44	2.70	25.69	1.48	15.41	12.28	5.9	7.9	5.0	45.4
	1275	.4437	8.71	3.67	27.14	1.83	18.33	12.93	5.5	7.4	6.0	53.8
	1425	.4789	7.12	3.07	16.33	1.48	13.06	8.51	3.8	5.0	4.4	38.3
2	75	.3672	.99	.46	9.03	.61	4.32	3.41	4.5	6.6	1.4	12.4
	225	.3714	3.07	1.30	18.80	1.00	9.67	8.36	5.8	7.8	3.1	28.6
	375	.3762	4.97	2.10	23.63	1.24	12.98	11.89	5.9	7.9	4.1	38.9
	525	.3818	4.81	1.97	22.48	1.18	12.38	11.60	5.8	7.7	4.0	37.2
	675	.3885	4.66	1.93	21.83	1.20	12.04	11.00	5.7	7.6	3.9	36.3
	825	.3966	5.98	2.54	24.75	1.39	14.50	12.13	5.7	7.7	4.7	43.2
	975	.4071	8.83	3.70	29.69	1.68	19.09	14.47	5.8	7.7	6.1	56.4
	1125	.4213	11.84	4.96	32.29	2.00	23.07	16.19	5.7	7.3	7.4	67.9
	1275	.4436	12.19	5.22	27.68	2.11	22.00	14.66	4.9	6.3	7.1	64.7
	1425	.4789	9.89	4.45	18.11	1.58	16.43	10.59	3.6	4.7	5.5	48.3
3	75	.3824	2.45	1.03	13.67	.87	7.43	5.93	4.7	6.6	2.5	21.6
	225	.3804	4.64	1.96	22.64	1.18	12.50	10.69	5.9	7.9	4.0	36.9
	375	.3793	6.03	2.51	26.49	1.33	15.05	13.24	6.1	8.1	4.8	44.8
	525	.3827	6.56	2.69	26.65	1.42	15.58	13.60	5.9	7.7	5.0	46.5
	675	.3888	7.79	3.21	28.20	1.53	17.35	14.22	5.8	7.6	5.6	51.7
	825	.3969	10.50	4.43	32.39	1.80	21.73	16.40	5.8	7.6	6.9	64.0
	975	.4072	14.05	5.89	36.60	2.10	27.34	18.93	5.8	7.5	8.4	78.6
	1125	.4214	15.50	6.88	36.57	2.35	30.04	19.50	5.7	7.2	8.9	83.6
	1275	.4437	14.21	6.23	28.60	2.29	24.66	15.86	4.7	6.1	7.8	71.6
	1425	.4789	9.20	4.25	16.43	1.39	15.24	9.70	3.4	4.5	5.1	44.7

PREDICTED ION CONCENTRATIONS, ESP, SAR, EC, AND DISSOLVED CATIONS OF THE SOIL PROFILE FOR TREATMENT NO. 45 (WATER TABLE DEPTH 1500 MM; WATER TABLE EC 2 DS/M; CLAY LOAM SOIL; WHEAT CROP; 14 DAYS IRRIGATION INTERVAL WITH IRRIGATION APPLICATION AMOUNT AS 0.75 OF ET)

End of Year	Depth (mm)	Theta (cm3/cm3)	Ca	Mg	Na	K	Cl	SO4	ESP	SAR	EC (ds/m)	Diss. Cat. (meq/l)
			mmol/l									
1	75	.3947	.08	.00	2.12	.16	.90	.49	4.6	7.8	.3	2.4
	225	.4009	.08	.08	3.64	.25	1.49	.99	5.3	8.7	.5	4.1
	375	.4058	.34	.17	6.46	.34	2.68	2.18	5.7	8.9	.9	7.7
	525	.4093	.85	.34	10.15	.59	4.31	3.97	5.8	8.7	1.5	13.0
	675	.4120	1.53	.68	13.53	.77	6.13	5.87	6.0	8.5	2.1	18.6
	825	.4146	2.23	.94	15.93	.86	7.62	7.37	6.0	8.4	2.6	23.2
	975	.4185	2.85	1.21	17.99	1.04	8.91	8.73	6.1	8.3	3.0	27.2
	1125	.4269	4.23	1.76	21.61	1.23	11.47	10.76	6.2	8.3	3.8	34.7
	1275	.4460	7.00	2.95	26.82	1.57	16.13	13.82	6.2	8.2	5.3	48.2
	1425	.4794	7.82	3.37	22.29	1.58	15.65	12.18	5.0	6.5	5.2	46.3
2	75	.3948	.08	.00	1.79	.16	.82	.33	3.9	6.7	.3	2.0
	225	.4011	.08	.00	2.57	.17	1.08	.58	5.0	8.5	.3	2.9
	375	.4060	.08	.08	3.94	.25	1.59	1.01	5.5	9.1	.5	4.4
	525	.4096	.25	.08	6.01	.34	2.45	1.78	5.8	9.1	.8	7.1
	675	.4124	.60	.26	8.86	.51	3.75	3.07	5.9	8.9	1.3	11.0
	825	.4150	1.20	.51	12.35	.69	5.57	4.80	6.0	8.7	1.9	16.5
	975	.4190	2.42	1.04	16.88	.95	8.22	7.36	6.1	8.5	2.8	24.7
	1125	.4272	5.03	2.12	23.48	1.32	13.06	11.21	6.2	8.3	4.3	39.0
	1275	.4461	9.12	3.87	30.42	1.84	19.54	15.85	6.2	8.1	6.4	58.4
	1425	.4795	10.20	4.56	25.86	1.68	19.12	14.56	5.1	6.6	6.4	57.0
3	75	.3948	.08	.00	1.71	.16	.73	.33	3.3	5.5	.3	2.0
	225	.4012	.08	.00	2.32	.17	.99	.41	4.7	8.1	.3	2.6
	375	.4061	.08	.00	3.27	.17	1.34	.67	5.5	9.1	.4	3.6
	525	.4098	.17	.08	4.66	.25	1.95	1.10	5.7	9.3	.6	5.3
	675	.4126	.34	.17	6.65	.34	2.81	1.88	5.8	9.1	1.0	7.9
	825	.4153	.77	.34	9.78	.51	4.29	3.26	5.8	8.8	1.5	12.4
	975	.4192	1.91	.78	14.72	.87	7.10	5.63	5.9	8.4	2.4	20.9
	1125	.4274	4.68	1.94	22.43	1.32	12.54	9.89	6.0	8.2	4.2	37.0
	1275	.4462	9.22	3.96	30.51	1.84	19.82	15.12	6.2	8.1	6.6	58.6
	1425	.4795	10.60	4.76	27.05	1.68	20.11	14.76	5.2	6.7	6.6	59.5

PREDICTED ION CONCENTRATIONS, ESP, SAR, EC, AND DISSOLVED CATIONS OF THE SOIL PROFILE FOR TREATMENT NO. 46 (WATER TABLE DEPTH 1500 MM; WATER TABLE EC 2 DS/M; CLAY LOAM SOIL; WHEAT CROP; 14 DAYS IRRIGATION INTERVAL WITH IRRIGATION APPLICATION AMOUNT AS 0.50 OF ET)

End of Year	Depth (mm)	Theta (cm3/cm3)	Ca	Mg	Na	K	Cl	SO4	ESP	SAR	EC (ds/m)	Diss. Cat. (meq/l)
			mmol/l									
1	75	.3904	.16	.08	4.36	.24	1.77	1.37	4.8	7.7	.6	5.2
	225	.3958	.65	.25	8.50	.49	3.60	3.19	5.4	8.1	1.2	10.8
	375	.3994	1.49	.66	13.20	.74	6.02	5.69	5.8	8.3	2.0	18.3
	525	.4013	2.40	.99	16.33	.91	7.88	7.71	5.9	8.1	2.7	24.3
	675	.4028	2.75	1.17	17.39	.92	8.57	8.49	5.8	8.1	2.9	26.5
	825	.4055	2.93	1.17	17.85	1.01	8.88	8.80	5.9	8.0	2.9	27.1
	975	.4117	3.74	1.53	20.07	1.11	10.55	10.04	5.9	8.0	3.5	31.8
	1125	.4233	6.47	2.71	26.41	1.49	15.57	13.29	6.1	8.1	5.0	46.3
	1275	.4444	10.19	4.32	31.22	1.93	21.03	15.88	6.0	7.9	6.8	62.2
	1425	.4791	8.81	3.86	20.09	1.58	15.94	10.99	4.2	5.6	5.3	46.9
2	75	.3908	.16	.08	3.79	.24	1.61	1.05	4.4	7.2	.5	4.5
	225	.3962	.49	.25	7.37	.41	3.19	2.54	5.2	7.9	1.1	9.3
	375	.3999	1.24	.50	12.15	.66	5.54	4.79	5.7	8.3	1.8	16.4
	525	.4020	2.33	1.00	16.53	.91	7.97	7.31	6.0	8.3	2.6	24.0
	675	.4035	3.42	1.42	19.84	1.08	10.17	9.50	6.0	8.2	3.3	30.6
	825	.4062	4.87	2.01	23.16	1.26	12.67	11.50	6.0	8.1	4.1	38.2
	975	.4121	7.66	3.24	28.69	1.53	17.37	14.64	6.1	8.0	5.6	52.0
	1125	.4235	12.51	5.25	35.88	2.01	24.76	18.99	6.2	8.0	7.9	73.5
	1275	.4445	15.80	6.80	36.74	2.39	28.56	19.93	5.8	7.4	9.1	84.3
	1425	.4791	11.48	5.15	22.27	1.68	19.40	12.97	4.2	5.4	6.4	57.2
3	75	.3909	.16	.08	3.63	.24	1.62	.97	4.0	6.5	.5	4.4
	225	.3964	.49	.25	7.13	.41	3.19	2.29	5.0	7.6	1.1	9.1
	375	.4001	1.32	.58	12.23	.66	5.70	4.55	5.6	8.3	1.9	16.5
	525	.4022	2.58	1.08	17.53	.91	8.73	7.48	6.0	8.3	2.9	25.9
	675	.4038	4.51	1.84	22.69	1.25	12.26	10.60	6.1	8.3	4.0	36.6
	825	.4065	7.22	3.02	28.22	1.51	16.97	14.11	6.1	8.1	5.4	50.1
	975	.4123	10.82	4.60	34.76	1.87	23.94	18.57	6.3	8.2	7.2	67.5
	1125	.4236	13.48	6.39	41.40	2.28	32.30	22.76	6.8	8.7	8.7	83.4
	1275	.4445	16.07	7.44	39.58	2.48	34.07	21.03	6.1	7.8	9.5	89.0
	1425	.4791	12.08	5.54	23.46	1.68	21.88	13.66	4.3	5.5	6.6	60.4

PREDICTED ION CONCENTRATIONS, ESP, SAR, EC, AND DISSOLVED CATIONS OF THE SOIL PROFILE
FOR TREATMENT NO. 47 (WATER TABLE DEPTH 1500 MM; WATER TABLE EC 2 DS/M; CLAY LOAM SOIL;
WHEAT CROP; 04 DAYS IRRIGATION INTERVAL WITH IRRIGATION APPLICATION AMOUNT AS 0.75 OF ET)

End of Year	Depth (mm)	Theta (cm3/cm3)	Ca	Mg	Na	K	Cl	SO4	ESP	SAR	EC (ds/m)	Diss. Cat. (meq/l)
			mmol/l									
1	75	.3794	.16	.08	3.92	.24	1.65	1.02	4.3	7.1	.6	4.7
	225	.3834	.87	.32	9.98	.55	4.44	3.56	5.5	8.2	1.5	12.9
	375	.3859	2.63	1.12	17.46	.96	8.61	7.97	5.9	8.1	2.8	25.8
	525	.3882	3.61	1.52	19.89	1.04	10.27	10.03	5.9	7.9	3.4	31.5
	675	.3920	3.16	1.30	18.39	.97	9.31	9.23	5.8	7.8	3.1	28.6
	825	.3984	2.80	1.15	17.37	.99	8.56	8.56	5.8	7.9	2.8	26.3
	975	.4079	3.03	1.26	17.95	1.01	9.10	8.85	5.8	7.9	3.0	27.6
	1125	.4216	3.92	1.66	20.47	1.13	10.98	10.02	6.0	8.1	3.6	32.8
	1275	.4438	5.23	2.20	22.83	1.38	13.30	10.64	5.9	8.0	4.4	39.2
	1425	.4789	5.54	2.37	17.12	1.39	11.68	8.21	4.4	6.0	4.0	34.3
2	75	.3817	.24	.08	3.71	.32	1.66	.95	3.8	6.1	.6	4.6
	225	.3860	.88	.40	9.97	.56	4.55	3.35	5.3	8.0	1.5	13.1
	375	.3889	2.81	1.21	18.96	.96	9.48	8.12	6.1	8.5	3.1	28.0
	525	.3913	4.61	1.94	23.69	1.21	12.61	11.64	6.2	8.3	4.1	37.9
	675	.3946	4.81	2.04	23.40	1.22	12.64	12.07	6.0	8.1	4.1	38.3
	825	.4003	4.71	1.98	22.66	1.24	12.32	11.50	6.0	7.9	4.0	37.1
	975	.4089	5.24	2.20	23.66	1.27	13.35	11.66	6.0	8.0	4.3	39.9
	1125	.4221	6.63	2.79	25.64	1.48	15.52	12.21	5.8	7.8	5.0	45.9
	1275	.4440	8.07	3.39	24.86	1.74	16.79	12.11	5.2	7.1	5.6	49.4
	1425	.4790	7.22	3.17	17.32	1.48	13.46	9.10	3.9	5.2	4.6	39.7
3	75	.3834	.24	.08	3.64	.32	1.66	.95	3.3	5.4	.6	4.6
	225	.3881	.96	.40	10.10	.64	4.73	3.37	5.1	7.6	1.6	13.5
	375	.3912	3.23	1.37	20.45	1.05	10.51	8.41	6.2	8.6	3.4	30.6
	525	.3935	5.69	2.36	27.40	1.38	15.12	13.09	6.6	8.7	4.8	44.8
	675	.3966	6.72	2.79	28.60	1.47	16.39	14.59	6.4	8.4	5.2	49.0
	825	.4016	7.05	2.90	28.21	1.49	16.60	14.35	6.2	8.1	5.3	49.6
	975	.4097	7.79	3.30	28.70	1.61	17.69	14.22	6.0	8.0	5.7	52.5
	1125	.4225	9.25	3.93	28.81	1.75	19.20	14.32	5.6	7.4	6.3	56.8
	1275	.4441	10.18	4.31	25.97	1.93	19.36	13.40	5.0	6.5	6.4	57.0
	1425	.4790	8.41	3.76	17.72	1.48	14.85	9.80	3.8	5.0	5.0	43.6

PREDICTED ION CONCENTRATIONS, ESP, SAR, EC, AND DISSOLVED CATIONS OF THE SOIL PROFILE FOR TREATMENT NO. 48 (WATER TABLE DEPTH 1500 MM; WATER TABLE EC 2 DS/M; CLAY LOAM SOIL; WHEAT CROP; 04 DAYS IRRIGATION INTERVAL WITH IRRIGATION APPLICATION AMOUNT AS 0.50 OF ET)

End of Year	Depth (mm)	Theta (cm3/cm3)	Ca	Mg	Na	K	Cl	SO4	ESP	SAR	EC (ds/m)	Diss. Cat. (meq/l)
			mmol/l									
1	75	.3817	.55	.24	6.94	.47	3.08	2.37	4.7	7.2	1.0	8.9
	225	.3858	1.91	.80	14.59	.80	6.93	6.30	5.7	8.0	2.3	20.7
	375	.3880	2.97	1.20	17.96	.96	8.98	8.74	5.8	7.9	3.0	27.8
	525	.3896	2.74	1.13	17.07	.97	8.45	8.37	5.6	7.7	2.8	26.1
	675	.3927	2.43	1.05	16.15	.89	7.87	7.87	5.7	7.8	2.6	24.1
	825	.3986	2.72	1.15	17.05	.91	8.40	8.32	5.7	7.9	2.8	25.6
	975	.4079	3.88	1.60	20.23	1.10	10.79	10.11	5.8	7.9	3.5	32.4
	1125	.4216	6.53	2.70	26.31	1.48	15.59	12.89	6.1	8.1	5.0	46.3
	1275	.4438	8.99	3.76	28.61	1.83	19.07	13.75	5.8	7.7	6.2	55.9
	1425	.4789	7.22	3.17	16.92	1.48	13.36	8.81	3.9	5.2	4.5	39.2
2	75	.3823	.71	.32	7.66	.47	3.55	2.69	4.4	6.6	1.2	10.3
	225	.3865	2.56	1.12	17.09	.96	8.54	7.35	5.7	8.0	2.8	25.3
	375	.3888	4.10	1.69	21.77	1.12	11.49	10.60	6.0	8.1	3.7	34.5
	525	.3904	4.11	1.69	21.13	1.13	11.21	10.73	5.9	7.8	3.6	33.9
	675	.3934	4.23	1.79	21.13	1.14	11.38	10.65	5.8	7.8	3.7	34.4
	825	.3991	5.69	2.39	24.41	1.32	14.02	12.12	5.9	7.8	4.5	42.0
	975	.4082	8.60	3.63	29.86	1.69	18.89	14.76	6.0	7.8	6.1	55.9
	1125	.4217	12.11	5.14	33.81	2.00	23.87	17.08	5.8	7.6	7.7	70.3
	1275	.4438	13.02	5.59	29.89	2.20	23.57	15.77	5.0	6.7	7.6	69.2
	1425	.4789	8.41	3.76	16.43	1.48	14.45	9.20	3.5	4.7	4.9	42.3
3	75	.3826	.95	.40	8.46	.55	4.11	3.08	4.3	6.3	1.4	11.9
	225	.3868	3.52	1.44	19.82	1.12	10.47	8.71	5.8	8.0	3.4	30.8
	375	.3891	5.87	2.49	26.61	1.37	14.95	13.18	6.3	8.3	4.8	44.6
	525	.3908	6.54	2.75	27.13	1.37	15.75	13.97	6.1	8.0	5.0	47.1
	675	.3937	7.48	3.09	28.14	1.46	17.00	14.32	5.9	7.8	5.5	50.8
	825	.3993	9.90	4.13	31.93	1.73	20.79	16.17	5.9	7.8	6.7	61.7
	975	.4083	13.24	5.57	36.02	2.02	25.73	18.39	5.9	7.7	8.2	75.7
	1125	.4218	15.60	6.71	36.60	2.35	29.02	19.26	5.7	7.2	8.9	83.5
	1275	.4438	15.04	6.51	30.17	2.29	25.77	16.78	4.8	6.2	8.2	75.6
	1425	.4789	9.00	4.06	16.23	1.39	14.94	9.50	3.4	4.5	5.0	43.8

PREDICTED ION CONCENTRATIONS, ESP, SAR, EC, AND DISSOLVED CATIONS OF THE SOIL PROFILE FOR TREATMENT NO. 49 (WATER TABLE DEPTH 1500 MM; WATER TABLE EC 6 DS/M; SANDY LOAM SOIL; COTTON CROP; 14 DAYS IRRIGATION INTERVAL WITH IRRIGATION APPLICATION AMOUNT AS 0.75 OF ET)

End of Year	Depth (mm)	Theta (cm3/cm3)	Ca	Mg	Na	K	Cl	SO4	ESP	SAR	EC (ds/m)	Diss. Cat. (meq/l)
			mmol/l									
1	75	.3133	.06	.00	2.40	.13	.97	.58	3.8	6.4	.3	2.7
	225	.3196	.26	.13	4.75	.26	1.98	1.45	4.2	6.7	.7	5.7
	375	.3263	.81	.34	8.90	.47	3.91	3.37	4.7	6.9	1.3	11.6
	525	.3336	1.72	.76	13.10	.69	6.20	5.79	4.9	6.9	2.0	18.7
	675	.3412	2.54	1.06	15.51	.85	7.75	7.47	5.0	6.9	2.6	23.7
	825	.3487	2.74	1.15	16.14	.86	8.14	8.00	5.1	6.9	2.7	24.9
	975	.3576	2.73	1.11	16.11	.89	8.05	8.13	5.2	7.0	2.7	25.0
	1125	.3714	3.84	1.61	19.03	1.07	10.51	11.36	5.4	7.1	3.7	34.2
	1275	.3969	8.20	4.10	34.69	1.56	22.72	25.91	7.3	9.0	8.0	77.4
	1425	.4617	11.35	7.35	46.07	1.72	31.38	36.92	8.7	10.4	11.0	108.0
2	75	.3153	.07	.00	1.63	.13	.72	.33	3.1	5.3	.2	1.9
	225	.3212	.07	.00	2.26	.13	.93	.46	4.0	6.8	.3	2.6
	375	.3273	.14	.07	3.52	.20	1.49	.81	4.5	7.5	.5	4.0
	525	.3328	.28	.14	5.78	.34	2.48	1.65	4.8	7.6	.8	6.9
	675	.3386	.70	.28	9.09	.49	3.99	3.15	5.0	7.6	1.3	11.6
	825	.3456	1.50	.64	12.85	.71	6.07	5.28	5.2	7.4	2.0	17.9
	975	.3553	2.79	1.17	17.03	.88	8.81	8.37	5.4	7.3	2.9	26.6
	1125	.3703	5.13	2.22	24.71	1.22	14.46	14.54	6.1	8.0	4.8	45.0
	1275	.3967	9.92	6.23	45.08	1.80	27.05	31.31	8.2	10.2	9.3	92.5
	1425	.4616	11.35	10.20	60.28	1.72	39.29	42.06	10.5	12.7	12.6	126.8
3	75	.3269	.07	.07	2.03	.20	.95	.41	2.8	4.6	.3	2.4
	225	.3331	.07	.07	2.89	.21	1.24	.62	3.9	6.6	.4	3.4
	375	.3377	.14	.07	4.33	.28	1.88	.98	4.7	7.6	.6	5.0
	525	.3412	.35	.14	6.49	.35	2.82	1.76	4.9	7.8	.9	7.9
	675	.3447	.85	.36	9.83	.50	4.49	3.42	5.1	7.6	1.4	12.8
	825	.3494	2.09	.87	14.80	.79	7.58	6.71	5.3	7.3	2.4	21.8
	975	.3573	5.02	2.14	23.03	1.18	14.62	14.03	5.8	7.4	4.7	44.1
	1125	.3711	7.05	3.99	39.72	1.46	31.44	27.91	8.4	10.5	9.4	90.2
	1275	.3969	9.27	10.50	73.56	2.13	52.56	44.61	12.0	15.1	14.2	145.1
	1425	.4617	11.07	12.59	65.73	1.62	43.40	45.79	11.0	13.2	13.6	138.7

PREDICTED ION CONCENTRATIONS, ESP, SAR, EC, AND DISSOLVED CATIONS OF THE SOIL PROFILE FOR TREATMENT NO. 50 (WATER TABLE DEPTH 1500 MM; WATER TABLE EC 6 DS/M; SANDY LOAM SOIL; COTTON CROP; 14 DAYS IRRIGATION INTERVAL WITH IRRIGATION APPLICATION AMOUNT AS 0.50 OF ET)

End of Year	Depth (mm)	Theta (cm3/cm3)	Ca	Mg	Na	K	Cl	SO4	ESP	SAR	EC (ds/m)	Diss. Cat. (meq/l)
			mmol/l									
1	75	.2945	.49	.18	6.02	.37	2.62	2.13	3.8	5.8	.9	7.7
	225	.3035	1.32	.56	10.60	.56	5.02	4.51	4.3	6.1	1.6	14.9
	375	.3115	2.45	1.03	14.61	.77	7.40	7.08	4.6	6.3	2.5	22.8
	525	.3192	2.64	1.12	15.17	.86	7.72	7.58	4.7	6.3	2.6	24.1
	675	.3276	2.30	.95	14.28	.81	7.04	7.04	4.7	6.5	2.4	21.8
	825	.3375	2.16	.91	13.95	.77	6.76	6.83	4.8	6.7	2.3	20.9
	975	.3501	2.82	1.16	16.06	.87	8.32	8.46	5.0	6.8	2.8	25.8
	1125	.3678	7.22	3.04	26.52	1.37	18.62	17.40	5.7	7.2	5.7	54.8
	1275	.3962	10.40	6.96	55.75	1.96	46.25	33.48	9.6	12.1	11.7	116.1
	1425	.4613	11.72	10.01	55.85	1.81	38.51	40.41	9.7	11.8	12.3	122.6
2	75	.3123	.13	.06	3.16	.19	1.36	.84	3.5	5.6	.5	3.7
	225	.3180	.46	.20	6.50	.39	2.89	2.10	4.3	6.6	.9	8.2
	375	.3240	1.41	.60	11.78	.67	5.56	4.69	4.8	6.9	1.8	16.3
	525	.3298	2.79	1.16	16.63	.89	8.52	7.70	5.0	7.0	2.7	25.3
	675	.3361	3.82	1.60	18.89	.97	10.28	9.79	5.1	6.8	3.3	31.2
	825	.3437	4.76	1.99	20.74	1.14	12.71	12.07	5.1	6.7	4.1	38.1
	975	.3541	7.32	3.07	27.29	1.32	21.44	18.80	5.8	7.2	6.4	60.7
	1125	.3698	9.32	5.50	48.59	1.68	43.02	32.40	8.9	11.1	11.3	110.6
	1275	.3966	9.01	12.29	84.48	2.29	66.46	50.07	13.3	16.6	16.6	170.1
	1425	.4615	10.87	14.78	76.76	1.72	57.59	51.20	12.3	14.8	16.1	163.9
3	75	.3217	.40	.13	4.72	.33	2.19	1.40	3.4	5.3	.7	6.1
	225	.3270	.81	.34	8.38	.54	3.99	2.84	4.3	6.4	1.3	11.2
	375	.3307	1.84	.75	13.60	.75	6.83	5.53	4.9	7.0	2.2	19.6
	525	.3338	3.45	1.45	18.55	.97	10.28	9.03	5.2	7.0	3.2	29.5
	675	.3376	5.30	2.23	22.32	1.19	14.72	13.04	5.2	6.8	4.5	42.3
	825	.3439	7.89	3.27	28.00	1.35	23.80	19.26	5.7	7.0	6.8	64.3
	975	.3539	9.21	4.75	43.80	1.61	44.60	29.03	8.0	10.0	11.0	105.2
	1125	.3696	8.48	10.08	82.85	2.06	77.36	46.51	13.2	16.9	17.2	173.7
	1275	.3966	8.03	20.98	119.72	2.62	90.30	71.21	16.5	20.2	22.3	237.0
	1425	.4615	10.58	16.69	77.62	1.53	52.92	54.35	12.3	14.4	16.0	165.7

PREDICTED ION CONCENTRATIONS, ESP, SAR, EC, AND DISSOLVED CATIONS OF THE SOIL PROFILE FOR TREATMENT NO. 51 (WATER TABLE DEPTH 1500 MM; WATER TABLE EC 6 DS/M; SANDY LOAM SOIL; COTTON CROP; 04 DAYS IRRIGATION INTERVAL WITH IRRIGATION APPLICATION AMOUNT AS 0.75 OF ET)

End of Year	Depth (mm)	Theta (cm3/cm3)	Ca	Mg	Na	K	Cl	SO4	ESP	SAR	EC (ds/m)	Diss. Cat. (meq/l)
			mmol/l									
1	75	.3241	.33	.13	5.02	.33	2.21	1.47	4.0	6.2	.7	6.2
	225	.3270	1.76	.74	13.17	.74	6.42	5.47	4.9	6.8	2.1	19.0
	375	.3244	3.42	1.41	17.63	.94	9.32	8.78	4.9	6.6	3.0	28.3
	525	.3243	2.68	1.14	15.34	.87	7.84	7.71	4.7	6.4	2.6	24.1
	675	.3297	2.04	.82	13.35	.75	6.47	6.47	4.7	6.5	2.2	19.9
	825	.3388	1.89	.77	13.16	.77	6.30	6.30	4.8	6.7	2.1	19.3
	975	.3512	2.39	1.02	14.73	.80	7.18	7.55	5.0	6.8	2.5	22.9
	1125	.3686	5.10	2.13	21.02	1.14	11.96	14.24	5.3	6.8	4.4	41.6
	1275	.3964	10.16	4.83	36.36	1.72	25.55	29.32	7.0	8.5	9.0	87.0
	1425	.4614	11.82	7.15	42.61	1.72	28.79	34.51	7.9	9.5	10.3	101.0
2	75	.3302	.27	.14	3.82	.27	1.77	1.02	3.3	5.3	.6	4.8
	225	.3292	1.16	.48	10.81	.61	5.17	3.74	4.8	6.9	1.7	14.8
	375	.3246	3.42	1.48	19.18	.94	10.19	8.45	5.2	7.1	3.2	29.9
	525	.3254	4.30	1.82	20.17	1.08	11.16	10.22	5.0	6.7	3.6	33.5
	675	.3313	3.70	1.57	18.00	.96	9.72	9.58	4.9	6.5	3.2	29.9
	825	.3402	3.87	1.62	18.06	.98	10.05	10.68	4.9	6.5	3.5	32.3
	975	.3521	5.75	2.40	22.19	1.16	14.55	16.08	5.2	6.6	5.1	48.2
	1125	.3690	7.24	3.51	32.02	1.37	25.16	25.54	6.9	8.5	8.2	79.1
	1275	.3964	9.66	6.72	50.70	1.88	38.08	36.61	9.2	11.3	11.5	114.3
	1425	.4614	11.34	9.63	54.34	1.72	39.47	40.90	9.6	11.5	12.6	124.9
3	75	.3355	.69	.28	5.48	.42	2.84	1.66	3.1	4.7	1.0	7.8
	225	.3191	1.78	.79	12.66	.73	6.53	4.62	4.5	6.5	2.1	18.5
	375	.3146	3.64	1.56	19.69	.97	10.72	8.64	5.1	7.0	3.4	31.1
	525	.3203	4.70	1.92	21.31	1.06	12.11	10.92	5.1	6.8	3.8	35.6
	675	.3283	5.02	2.10	20.82	1.09	12.48	12.28	5.0	6.4	4.1	38.4
	825	.3383	6.36	2.66	23.07	1.26	16.08	16.36	5.1	6.4	5.3	50.4
	975	.3510	8.63	3.77	31.11	1.45	26.62	25.16	6.2	7.5	8.3	79.4
	1125	.3685	8.98	5.79	50.25	1.68	45.07	34.79	9.2	11.4	12.0	117.5
	1275	.3964	9.01	10.89	74.53	2.13	57.58	48.16	12.2	15.2	15.5	157.4
	1425	.4614	11.06	11.82	60.06	1.53	41.18	45.09	10.3	12.3	13.4	135.0

PREDICTED ION CONCENTRATIONS, ESP, SAR, EC, AND DISSOLVED CATIONS OF THE SOIL PROFILE FOR TREATMENT NO. 52 (WATER TABLE DEPTH 1500 MM; WATER TABLE EC 6 DS/M; SANDY LOAM SOIL; COTTON CROP; 04 DAYS IRRIGATION INTERVAL WITH IRRIGATION APPLICATION AMOUNT AS 0.50 OF ET)

End of Year	Depth (mm)	Theta (cm3/cm3)	Ca	Mg	Na	K	Cl	SO4	ESP	SAR	EC (ds/m)	Diss. Cat. (meq/l)
			mmol/l									
1	75	.3162	.98	.39	8.95	.52	4.18	3.40	4.2	6.1	1.4	12.2
	225	.3183	2.83	1.18	15.85	.85	8.22	7.63	4.7	6.4	2.7	24.7
	375	.3187	2.57	1.05	14.82	.79	7.57	7.37	4.6	6.3	2.5	23.4
	525	.3222	1.86	.80	12.71	.73	6.12	6.12	4.6	6.4	2.1	19.0
	675	.3290	1.70	.68	12.30	.68	5.85	5.85	4.7	6.5	2.0	17.9
	825	.3384	1.89	.77	13.00	.70	6.22	6.29	4.8	6.7	2.1	19.2
	975	.3510	2.90	1.23	15.88	.87	8.56	9.14	5.0	6.7	3.0	27.5
	1125	.3685	7.23	3.05	26.19	1.37	19.87	20.86	5.8	7.2	6.7	63.3
	1275	.3964	9.34	6.14	52.50	1.80	44.80	39.72	9.8	12.0	12.9	127.5
	1425	.4614	10.87	9.91	55.29	1.72	37.66	45.00	9.9	11.8	13.1	131.3
2	75	.3063	.89	.38	7.85	.51	3.80	2.78	3.7	5.6	1.2	10.8
	225	.3114	3.02	1.29	16.92	.90	8.94	7.59	4.8	6.6	2.9	26.4
	375	.3173	4.00	1.70	19.01	.98	10.49	9.57	4.9	6.4	3.3	31.3
	525	.3239	3.15	1.34	16.40	.87	8.77	8.50	4.7	6.4	2.9	26.8
	675	.3316	3.08	1.30	15.96	.89	8.98	9.04	4.7	6.4	3.0	27.8
	825	.3406	4.93	2.04	19.84	1.13	13.93	13.79	4.9	6.3	4.6	42.6
	975	.3524	8.66	3.64	29.92	1.46	26.94	23.66	6.0	7.3	8.0	76.2
	1125	.3691	9.00	5.80	53.08	1.68	49.72	35.92	9.7	12.0	12.7	124.4
	1275	.3965	8.52	12.94	86.43	2.21	66.93	55.95	13.7	16.9	17.7	182.7
	1425	.4614	10.68	14.30	71.31	1.62	51.57	51.48	11.7	13.9	15.6	158.4
3	75	.3239	2.07	.94	11.31	.74	6.29	4.75	4.0	5.6	2.2	18.0
	225	.3125	3.87	1.61	18.98	1.03	10.65	8.85	4.8	6.5	3.4	31.1
	375	.3138	4.47	1.88	20.10	1.04	11.67	10.50	4.9	6.4	3.6	33.9
	525	.3202	4.30	1.79	18.72	.99	11.78	11.05	4.8	6.2	3.8	35.1
	675	.3283	4.95	2.03	19.67	1.09	15.94	14.18	4.8	6.1	5.0	45.7
	825	.3382	3.56	1.61	20.54	.91	27.67	20.75	6.1	7.5	7.9	72.7
	975	.3510	.94	.94	27.56	.65	49.97	30.82	13.4	17.4	12.9	120.1
	1125	.3685	7.84	10.35	83.67	1.98	79.56	53.52	13.6	17.1	18.8	190.2
	1275	.3964	7.86	21.13	116.79	2.54	86.90	74.45	16.3	19.7	22.5	240.1
	1425	.4614	10.39	16.40	74.64	1.43	50.72	55.58	12.0	14.1	16.1	165.9

PREDICTED ION CONCENTRATIONS, ESP, SAR, EC, AND DISSOLVED CATIONS OF THE SOIL PROFILE FOR TREATMENT NO. 53 (WATER TABLE DEPTH 1500 MM; WATER TABLE EC 6 DS/M; SANDY LOAM SOIL; WHEAT CROP; 14 DAYS IRRIGATION INTERVAL WITH IRRIGATION APPLICATION AMOUNT AS 0.75 OF ET)

End of Year	Depth (mm)	Theta (cm3/cm3)	Ca	Mg	Na	K	Cl	SO4	ESP	SAR	EC (ds/m)	Diss. Cat. (meq/l)
			mmol/l									
1	75	.3517	.07	.00	2.03	.15	.87	.44	4.1	7.0	.3	2.3
	225	.3601	.15	.07	3.87	.22	1.56	1.04	4.8	7.9	.5	4.5
	375	.3629	.52	.22	7.57	.45	3.22	2.70	5.2	7.9	1.1	9.4
	525	.3586	1.41	.59	12.30	.67	5.63	5.19	5.3	7.5	1.9	17.0
	675	.3491	2.38	1.01	15.29	.79	7.50	7.21	5.2	7.1	2.5	23.0
	825	.3454	2.71	1.14	16.06	.86	8.06	7.92	5.1	6.9	2.7	24.9
	975	.3530	2.77	1.17	16.26	.88	8.17	8.24	5.1	7.0	2.7	25.4
	1125	.3691	4.19	1.75	19.75	1.07	10.75	11.29	5.3	7.1	3.7	34.3
	1275	.3965	10.57	4.92	37.19	1.72	24.00	26.46	7.0	8.5	8.1	79.6
	1425	.4614	11.92	8.29	49.76	1.81	33.27	35.84	8.9	10.9	10.9	108.3
2	75	.3521	.07	.00	1.82	.15	.80	.36	3.5	5.9	.3	2.0
	225	.3608	.07	.00	2.91	.15	1.19	.60	4.6	7.7	.4	3.3
	375	.3642	.23	.08	5.12	.30	2.18	1.35	5.1	8.2	.7	6.0
	525	.3609	.67	.30	8.80	.45	3.88	2.98	5.3	8.0	1.3	11.2
	675	.3524	1.53	.66	12.96	.66	6.04	5.24	5.3	7.5	2.0	18.0
	825	.3479	2.73	1.15	16.53	.86	8.34	7.91	5.2	7.1	2.7	25.2
	975	.3543	4.39	1.83	20.50	1.10	11.57	11.79	5.3	7.0	3.9	36.3
	1125	.3696	5.96	2.83	29.09	1.30	19.47	20.16	6.8	8.6	6.6	62.8
	1275	.3965	9.42	7.13	54.56	1.88	38.75	38.42	9.8	12.2	11.9	118.8
	1425	.4615	11.06	11.25	63.89	1.72	46.34	45.77	11.0	13.3	14.1	141.6
3	75	.3523	.07	.00	1.67	.15	.73	.36	3.0	4.9	.3	2.0
	225	.3612	.07	.00	2.61	.15	1.12	.52	4.3	7.3	.4	3.0
	375	.3651	.15	.08	4.38	.23	1.89	.98	5.1	8.3	.6	5.1
	525	.3629	.45	.15	7.20	.37	3.15	2.10	5.2	8.2	1.0	8.8
	675	.3552	1.10	.44	11.08	.59	5.21	4.11	5.3	7.8	1.7	14.8
	825	.3502	2.32	1.01	15.70	.80	8.25	7.45	5.4	7.3	2.6	24.0
	975	.3555	4.55	1.91	22.62	1.10	13.66	13.44	5.9	7.6	4.5	42.2
	1125	.3700	7.49	4.13	37.76	1.53	25.46	25.53	7.7	9.7	8.1	79.4
	1275	.3966	9.10	10.00	69.24	2.05	48.10	45.56	11.6	14.4	14.0	142.6
	1425	.4615	10.68	13.83	75.52	1.72	54.83	51.97	12.4	14.9	16.0	162.6

PREDICTED ION CONCENTRATIONS, ESP, SAR, EC, AND DISSOLVED CATIONS OF THE SOIL PROFILE FOR TREATMENT NO. 54 (WATER TABLE DEPTH 1500 MM; WATER TABLE EC 6 DS/M; SANDY LOAM SOIL; WHEAT CROP; 14 DAYS IRRIGATION INTERVAL WITH IRRIGATION APPLICATION AMOUNT AS 0.50 OF ET)

End of Year	Depth (mm)	Theta (cm3/cm3)	Ca	Mg	Na	K	Cl	SO4	ESP	SAR	EC (ds/m)	Diss. Cat. (meq/l)
			mmol/l									
1	75	.3446	.14	.07	3.99	.28	1.64	1.21	4.3	6.8	.6	4.8
	225	.3495	.72	.29	8.59	.51	3.75	3.25	4.8	7.2	1.3	11.1
	375	.3460	1.93	.79	13.87	.79	6.65	6.29	5.1	7.1	2.2	20.3
	525	.3368	2.71	1.11	15.80	.84	8.00	7.79	4.9	6.7	2.7	24.8
	675	.3334	2.48	1.03	15.02	.83	7.51	7.44	4.8	6.6	2.5	23.1
	825	.3394	2.24	.91	14.38	.77	7.01	7.01	4.9	6.7	2.3	21.7
	975	.3512	2.83	1.16	16.11	.87	8.27	8.34	5.1	6.8	2.8	25.6
	1125	.3686	7.01	2.97	26.27	1.37	17.97	16.45	5.6	7.2	5.5	52.2
	1275	.3964	10.57	6.96	56.02	1.97	46.03	32.02	9.6	12.1	11.5	112.9
	1425	.4614	11.54	10.49	59.39	1.81	41.95	40.90	10.1	12.4	12.7	127.3
2	75	.3453	.14	.07	3.78	.29	1.64	1.07	3.9	6.3	.5	4.6
	225	.3505	.72	.29	8.26	.51	3.69	2.90	4.7	7.1	1.2	10.8
	375	.3476	1.94	.79	14.36	.79	6.97	6.10	5.2	7.3	2.3	20.7
	525	.3387	3.22	1.33	17.91	.91	9.38	8.75	5.2	7.0	3.0	28.1
	675	.3348	3.80	1.59	18.68	.97	10.31	9.89	5.0	6.7	3.3	31.2
	825	.3403	4.92	2.04	20.67	1.12	13.01	12.16	5.1	6.5	4.1	38.5
	975	.3517	8.28	3.49	28.70	1.45	22.89	19.33	5.7	7.1	6.7	63.3
	1125	.3687	9.75	5.71	50.66	1.75	46.39	30.17	8.9	11.2	11.2	109.4
	1275	.3964	9.01	13.68	93.53	2.38	75.35	51.60	14.0	17.8	17.7	182.2
	1425	.4614	10.96	14.78	73.40	1.72	51.67	49.86	11.8	14.1	15.2	155.2
3	75	.3456	.21	.07	3.71	.29	1.64	1.00	3.6	5.9	.5	4.6
	225	.3511	.80	.36	8.41	.51	3.92	2.90	4.6	6.8	1.3	11.2
	375	.3486	2.23	.94	15.27	.79	7.78	6.41	5.3	7.3	2.5	22.4
	525	.3401	4.15	1.76	20.59	1.05	11.81	10.33	5.3	7.1	3.6	33.7
	675	.3359	6.04	2.50	23.74	1.25	16.10	14.02	5.3	6.7	4.8	45.6
	825	.3410	8.45	3.52	29.03	1.41	24.45	19.38	5.6	7.0	6.9	65.0
	975	.3521	9.46	4.80	43.14	1.60	41.68	27.28	7.9	9.7	10.3	98.8
	1125	.3689	8.84	9.37	77.29	1.98	70.05	41.92	12.3	15.8	15.6	157.0
	1275	.3964	8.11	21.29	121.30	2.62	94.02	69.70	16.5	20.2	22.4	237.7
	1425	.4614	10.58	17.73	82.56	1.53	57.77	56.05	12.9	15.2	16.8	174.0

PREDICTED ION CONCENTRATIONS, ESP, SAR, EC, AND DISSOLVED CATIONS OF THE SOIL PROFILE FOR TREATMENT NO. 55 (WATER TABLE DEPTH 1500 MM; WATER TABLE EC 6 DS/M; SANDY LOAM SOIL; WHEAT CROP; 04 DAYS IRRIGATION INTERVAL WITH IRRIGATION APPLICATION AMOUNT AS 0.75 OF ET)

End of Year	Depth (mm)	Theta (cm3/cm3)	Ca	Mg	Na	K	Cl	SO4	ESP	SAR	EC (ds/m)	Diss. Cat. (meq/l)
			mmol/l									
1	75	.3290	.20	.07	4.01	.27	1.77	1.09	3.8	6.2	.6	4.9
	225	.3303	1.16	.48	10.92	.61	5.12	4.16	4.8	7.0	1.7	14.9
	375	.3267	2.90	1.22	16.67	.88	8.57	7.97	5.0	6.8	2.8	25.9
	525	.3264	2.76	1.15	15.71	.88	8.03	7.89	4.8	6.5	2.7	24.9
	675	.3312	2.12	.89	13.82	.75	6.77	6.71	4.7	6.6	2.3	20.8
	825	.3397	1.97	.84	13.41	.77	6.46	6.46	4.8	6.7	2.1	19.7
	975	.3516	2.25	.94	14.53	.80	7.05	7.26	5.0	6.9	2.4	21.9
	1125	.3688	4.57	1.90	20.12	1.14	10.82	12.19	5.3	6.9	3.9	36.1
	1275	.3964	10.73	4.83	35.46	1.72	23.59	25.63	6.6	8.1	8.0	77.6
	1425	.4614	12.11	7.05	42.42	1.81	28.60	32.79	7.8	9.4	10.0	97.3
2	75	.3332	.28	.14	3.99	.28	1.86	1.03	3.4	5.4	.6	5.0
	225	.3361	1.39	.56	11.81	.62	5.69	4.24	4.9	7.0	1.9	16.4
	375	.3334	3.58	1.52	19.56	.96	10.47	8.89	5.3	7.2	3.4	30.8
	525	.3317	3.97	1.64	19.33	1.03	10.49	9.80	5.1	6.8	3.4	31.5
	675	.3347	3.32	1.38	17.08	.97	8.92	8.92	4.9	6.6	3.0	27.7
	825	.3418	3.74	1.55	17.87	.99	9.60	10.10	4.9	6.5	3.3	30.6
	975	.3528	6.20	2.55	22.82	1.24	14.21	15.38	5.2	6.6	4.9	46.4
	1125	.3692	8.47	3.89	32.42	1.53	25.02	24.72	6.6	8.1	8.0	77.1
	1275	.3965	10.16	6.96	53.17	1.88	41.21	33.59	9.3	11.6	11.3	111.2
	1425	.4615	11.54	9.73	53.97	1.72	37.76	39.67	9.4	11.4	12.1	120.5
3	75	.3364	.28	.14	3.89	.28	1.88	1.04	3.1	4.9	.6	5.1
	225	.3404	1.55	.63	12.17	.70	6.12	4.29	4.8	7.0	2.0	17.3
	375	.3385	4.27	1.82	21.89	1.12	12.10	9.79	5.6	7.5	3.8	35.1
	525	.3358	5.34	2.22	23.31	1.18	13.46	12.14	5.3	7.0	4.2	39.7
	675	.3372	5.36	2.23	21.74	1.18	13.03	12.82	5.1	6.5	4.2	40.0
	825	.3432	6.59	2.69	23.54	1.28	15.95	16.03	5.1	6.5	5.2	49.5
	975	.3535	9.28	3.94	30.82	1.46	24.10	23.01	5.9	7.2	7.6	72.4
	1125	.3695	9.47	5.42	45.20	1.68	37.71	30.61	8.2	10.2	10.4	101.5
	1275	.3965	9.34	9.75	67.83	2.05	52.59	43.17	11.3	14.1	14.1	142.2
	1425	.4615	11.16	11.82	61.88	1.62	43.67	44.53	10.5	12.6	13.5	136.4

PREDICTED ION CONCENTRATIONS, ESP, SAR, EC, AND DISSOLVED CATIONS OF THE SOIL PROFILE
FOR TREATMENT NO. 56 (WATER TABLE DEPTH 1500 MM; WATER TABLE EC 6 DS/M; SANDY LOAM SOIL;
WHEAT CROP; 04 DAYS IRRIGATION INTERVAL WITH IRRIGATION APPLICATION AMOUNT AS 0.50 OF ET)

End of Year	Depth (mm)	Theta (cm3/cm3)	Ca	Mg	Na	K	Cl	SO4	ESP	SAR	EC (ds/m)	Diss. Cat. (meq/l)
			mmol/l									
1	75	.3302	.55	.20	6.62	.41	3.00	2.18	4.2	6.3	1.0	8.5
	225	.3306	1.98	.82	13.73	.75	6.69	6.08	4.8	6.8	2.2	20.2
	375	.3246	2.55	1.07	15.02	.80	7.58	7.38	4.8	6.4	2.6	23.6
	525	.3234	2.00	.87	13.23	.74	6.41	6.41	4.6	6.4	2.2	20.0
	675	.3288	1.77	.75	12.64	.68	6.05	6.05	4.7	6.5	2.0	18.5
	825	.3381	1.89	.77	13.20	.77	6.36	6.36	4.8	6.7	2.1	19.5
	975	.3508	2.83	1.16	16.02	.87	8.34	8.70	5.0	6.7	2.8	26.3
	1125	.3684	7.15	3.04	26.26	1.37	18.72	19.03	5.7	7.2	6.1	58.2
	1275	.3963	9.83	6.39	53.22	1.88	44.71	36.19	9.7	12.0	12.2	120.1
	1425	.4614	11.25	9.82	55.77	1.81	38.61	42.04	9.8	11.8	12.7	126.3
2	75	.3312	.82	.34	7.60	.48	3.63	2.60	4.0	5.9	1.2	10.4
	225	.3319	2.88	1.23	16.80	.89	8.78	7.47	5.0	6.9	2.8	25.9
	375	.3260	3.57	1.48	18.12	.94	9.70	9.03	4.9	6.6	3.1	29.2
	525	.3242	2.81	1.14	15.54	.87	8.11	7.97	4.8	6.4	2.7	24.9
	675	.3294	2.93	1.23	15.65	.88	8.64	8.58	4.7	6.3	2.9	26.5
	825	.3385	4.83	1.96	19.65	1.12	13.22	13.01	4.9	6.3	4.3	40.3
	975	.3511	8.63	3.63	29.09	1.45	25.10	22.92	5.8	7.0	7.7	72.9
	1125	.3685	8.98	5.56	50.48	1.68	48.19	35.10	9.4	11.6	12.4	121.4
	1275	.3964	8.76	13.02	89.60	2.29	72.07	54.38	13.9	17.4	17.9	184.4
	1425	.4614	10.87	13.82	67.40	1.62	45.57	48.81	11.2	13.3	14.4	147.1
3	75	.3315	1.03	.48	8.42	.55	4.25	3.01	3.8	5.7	1.4	12.0
	225	.3324	3.91	1.65	19.57	1.03	10.99	9.07	5.2	6.9	3.5	31.9
	375	.3264	5.13	2.16	21.98	1.15	13.02	11.67	5.1	6.7	4.0	37.8
	525	.3245	4.63	1.94	19.71	1.07	12.54	11.67	4.8	6.3	4.0	37.1
	675	.3296	5.72	2.38	21.18	1.16	16.55	14.64	4.8	6.1	5.1	47.1
	825	.3387	7.91	3.29	27.64	1.33	27.50	21.34	5.6	6.9	7.7	72.2
	975	.3511	7.91	4.43	43.96	1.45	45.99	31.85	8.6	10.7	11.6	111.9
	1125	.3686	8.30	9.44	77.91	1.98	70.83	46.84	12.7	16.1	16.6	167.8
	1275	.3964	8.03	20.23	113.92	2.54	86.73	69.86	16.0	19.4	21.8	230.5
	1425	.4614	10.58	16.21	73.88	1.43	49.19	53.58	11.8	13.9	15.5	160.3

PREDICTED ION CONCENTRATIONS, ESP, SAR, EC, AND DISSOLVED CATIONS OF THE SOIL PROFILE FOR TREATMENT NO. 57 (WATER TABLE DEPTH 1500 MM; WATER TABLE EC 6 DS/M; CLAY LOAM SOIL; COTTON CROP; 14 DAYS IRRIGATION INTERVAL WITH IRRIGATION APPLICATION AMOUNT AS 0.75 OF ET)

End of Year	Depth (mm)	Theta (cm3/cm3)	Ca	Mg	Na	K	Cl	SO4	ESP	SAR	EC (ds/m)	Diss. Cat. (meq/l)
			-----	-----	-----	mmol/l	-----	-----				
1	75	.3674	.08	.00	2.13	.15	1.14	.68	5.0	6.1	2.8	26.6
	225	.3719	.08	.00	2.07	.08	2.07	1.54	5.7	6.5	3.7	35.6
	375	.3767	.08	.08	3.58	.16	3.66	3.19	6.2	8.0	3.1	29.0
	525	.3823	.55	.24	8.29	.39	5.61	5.21	5.9	8.1	2.6	23.3
	675	.3889	1.77	.72	13.74	.72	7.15	6.83	5.6	7.7	2.7	24.9
	825	.3969	2.54	1.07	16.40	.90	8.12	8.12	5.7	7.9	2.9	26.3
	975	.4072	3.45	1.43	18.85	1.09	9.59	10.10	5.8	7.8	3.3	31.0
	1125	.4213	6.35	2.61	25.42	1.39	14.36	16.19	6.2	7.9	5.1	48.1
	1275	.4437	12.47	5.68	39.88	1.93	24.94	29.79	7.8	9.0	8.9	87.5
	1425	.4789	12.37	8.41	47.10	1.68	29.78	35.52	8.4	10.3	10.5	104.0
2	75	.3687	.08	.00	1.98	.15	.76	.38	3.7	6.3	.3	2.3
	225	.3730	.08	.08	3.24	.23	1.00	.46	4.6	7.6	.5	4.7
	375	.3779	.31	.16	6.32	.31	1.33	.78	5.6	8.6	1.2	11.2
	525	.3835	.24	.08	6.34	.32	2.06	1.43	6.6	9.7	1.6	15.1
	675	.3899	.24	.08	5.88	.32	3.14	2.50	6.4	9.1	2.1	19.3
	825	.3977	.33	.16	6.66	.33	4.93	4.44	6.4	8.8	2.7	24.1
	975	.4077	.84	.42	10.78	.51	8.34	8.42	6.6	8.8	3.6	32.3
	1125	.4216	3.40	1.74	22.91	1.05	15.51	17.51	7.4	9.5	5.9	55.0
	1275	.4438	10.64	6.51	43.37	1.83	26.13	37.32	8.3	10.0	10.5	104.1
	1425	.4789	11.48	9.70	53.23	1.58	33.15	43.24	9.7	11.5	12.3	123.3
3	75	.3772	.08	.08	2.26	.16	.94	.47	3.4	5.6	.3	2.7
	225	.3819	.08	.08	3.31	.24	1.18	.55	4.5	7.4	.4	4.0
	375	.3862	.24	.08	5.19	.32	1.60	.96	5.0	7.9	.8	7.7
	525	.3907	.40	.16	7.83	.40	2.34	1.61	6.3	9.4	1.4	13.3
	675	.3956	.41	.16	8.66	.41	3.68	3.11	6.8	9.9	2.0	18.1
	825	.4017	.83	.41	11.45	.50	6.81	6.97	6.9	9.5	3.1	27.6
	975	.4101	2.97	1.44	20.84	.93	14.57	16.44	7.1	9.1	5.7	52.0
	1125	.4227	7.42	4.63	40.00	1.57	29.08	32.75	8.8	10.8	10.2	98.3
	1275	.4442	10.10	9.64	61.58	1.93	41.48	47.27	11.0	13.3	13.9	139.7
	1425	.4790	11.48	11.28	57.50	1.39	38.00	45.72	10.1	12.0	13.2	133.2

PREDICTED ION CONCENTRATIONS, ESP, SAR, EC, AND DISSOLVED CATIONS OF THE SOIL PROFILE FOR TREATMENT NO. 58 (WATER TABLE DEPTH 1500 MM; WATER TABLE EC 6 DS/M; CLAY LOAM SOIL; COTTON CROP; 14 DAYS IRRIGATION INTERVAL WITH IRRIGATION APPLICATION AMOUNT AS 0.50 OF ET)

End of Year	Depth (mm)	Theta (cm3/cm3)	Ca	Mg	Na	K	Cl	SO4	ESP	SAR	EC (ds/m)	Diss. Cat. (meq/l)
			--------	--------	--------	mmol/l	--------	--------				
1	75	.3619	.52	.22	7.48	.45	3.22	2.69	4.8	7.3	1.1	9.5
	225	.3672	1.44	.61	11.99	.68	5.54	5.16	5.2	7.3	1.8	16.7
	375	.3732	2.47	1.00	16.04	.85	7.86	7.56	5.5	7.6	2.6	24.1
	525	.3797	2.90	1.18	17.42	.94	8.71	8.55	5.6	7.6	2.9	26.9
	675	.3869	2.88	1.20	17.35	.96	8.63	8.71	5.6	7.7	2.9	26.8
	825	.3955	3.27	1.39	18.30	.98	9.15	9.81	5.6	7.7	3.2	29.4
	975	.4062	5.79	2.43	23.58	1.34	13.60	15.19	5.8	7.5	4.8	45.1
	1125	.4208	9.13	4.26	35.82	1.65	27.47	28.00	7.4	9.0	9.0	86.7
	1275	.4434	11.45	8.06	58.26	2.20	44.16	37.47	10.1	12.6	12.3	122.5
	1425	.4788	12.27	9.79	51.44	1.68	34.53	39.27	9.1	11.0	11.7	116.3
2	75	.3683	.15	.08	3.88	.23	1.67	1.14	4.2	6.8	.6	4.6
	225	.3726	.46	.23	7.24	.46	3.16	2.46	4.9	7.5	1.0	9.1
	375	.3775	1.25	.55	11.93	.62	5.46	4.76	5.5	7.9	1.8	16.1
	525	.3831	2.45	1.03	16.62	.87	8.23	7.68	5.7	7.9	2.6	24.5
	675	.3896	4.11	1.69	20.93	1.13	11.51	11.19	5.9	7.8	3.8	35.0
	825	.3975	6.49	2.71	26.53	1.40	16.92	16.34	6.2	8.0	5.4	51.2
	975	.4076	9.68	4.38	37.98	1.68	28.04	24.93	7.4	9.3	8.3	80.3
	1125	.4216	10.63	7.58	59.67	2.09	45.56	37.28	10.5	13.1	12.4	123.3
	1275	.4438	10.36	12.38	78.03	2.29	57.31	49.79	12.7	15.7	15.8	160.4
	1425	.4789	11.38	13.46	69.66	1.58	51.65	49.57	11.7	13.9	15.3	154.7
3	75	.3756	.47	.23	5.74	.39	2.64	1.86	4.0	6.3	.9	7.5
	225	.3802	1.02	.39	9.58	.63	4.63	3.61	4.8	7.1	1.5	13.0
	375	.3846	2.07	.87	14.70	.87	7.63	6.60	5.4	7.6	2.4	21.5
	525	.3891	3.94	1.61	20.58	1.13	12.14	10.85	5.9	7.8	3.8	35.0
	675	.3943	6.76	2.85	27.70	1.38	19.47	17.27	6.3	8.1	5.9	55.6
	825	.4007	10.02	4.39	39.32	1.66	32.37	26.49	7.6	9.4	9.1	87.8
	975	.4095	10.32	6.85	61.42	1.95	53.30	37.57	10.8	13.6	13.3	131.6
	1125	.4224	9.60	12.83	91.11	2.44	73.48	53.93	14.3	18.0	18.1	185.1
	1275	.4441	9.63	17.98	99.19	2.48	70.93	63.22	14.9	18.1	19.3	201.5
	1425	.4790	11.38	14.75	68.58	1.39	47.31	49.98	11.4	13.4	14.9	151.1

PREDICTED ION CONCENTRATIONS, ESP, SAR, EC, AND DISSOLVED CATIONS OF THE SOIL PROFILE FOR TREATMENT NO. 59 (WATER TABLE DEPTH 1500 MM; WATER TABLE EC 6 DS/M; CLAY LOAM SOIL; COTTON CROP; 04 DAYS IRRIGATION INTERVAL WITH IRRIGATION APPLICATION AMOUNT AS 0.75 OF ET)

End of Year	Depth (mm)	Theta (cm3/cm3)	Ca	Mg	Na	K	Cl	SO4	ESP	SAR	EC (ds/m)	Diss. Cat. (meq/l)
			mmol/l									
1	75	.3775	.23	.08	5.07	.31	2.18	1.48	4.5	7.2	.7	6.2
	225	.3820	1.42	.63	12.79	.71	5.92	5.05	5.5	8.0	1.9	17.5
	375	.3858	3.51	1.43	19.93	1.04	10.28	9.65	5.9	8.0	3.3	30.9
	525	.3887	3.85	1.61	20.40	1.12	10.60	10.44	5.8	7.8	3.5	32.7
	675	.3925	3.08	1.30	18.08	.97	9.08	9.16	5.7	7.8	3.0	28.1
	825	.3987	3.05	1.24	17.79	.99	8.73	9.31	5.7	7.7	3.0	28.0
	975	.4080	4.72	1.94	21.07	1.18	10.87	13.32	5.7	7.5	4.1	38.3
	1125	.4217	9.06	3.75	28.75	1.57	17.34	23.09	6.1	7.5	6.8	65.2
	1275	.4438	11.46	5.59	38.69	1.93	26.50	31.73	7.3	9.0	9.6	93.1
	1425	.4789	12.47	7.22	40.17	1.68	26.52	33.84	7.5	9.0	10.0	97.6
2	75	.3819	.24	.08	3.79	.32	1.74	1.03	3.8	6.1	.6	4.7
	225	.3853	.80	.32	9.63	.56	4.38	3.26	5.3	8.0	1.4	12.6
	375	.3871	2.80	1.20	18.96	.96	9.52	8.08	6.2	8.5	3.1	28.0
	525	.3889	5.22	2.17	25.23	1.29	13.74	12.86	6.3	8.4	4.4	41.3
	675	.3924	6.49	2.68	26.59	1.38	15.16	15.65	6.1	7.9	5.0	47.8
	825	.3986	7.91	3.21	27.92	1.48	16.97	19.35	6.0	7.6	6.0	57.4
	975	.4080	10.20	4.21	32.62	1.69	22.34	26.22	6.5	7.8	8.0	77.0
	1125	.4217	10.63	5.40	41.12	1.83	30.06	32.93	7.9	9.6	10.2	99.0
	1275	.4438	10.91	7.34	49.61	2.02	35.30	38.33	9.1	11.1	11.7	115.3
	1425	.4789	12.17	9.10	48.58	1.58	33.94	38.49	8.7	10.5	11.6	114.3
3	75	.3896	.64	.24	5.72	.48	2.90	1.85	3.5	5.4	1.0	8.0
	225	.3875	1.60	.72	12.57	.80	6.24	4.72	5.1	7.4	2.1	18.0
	375	.3829	3.88	1.58	21.68	1.11	11.47	9.97	6.1	8.2	3.7	33.7
	525	.3837	6.42	2.70	28.06	1.35	16.33	15.78	6.3	8.2	5.2	49.4
	675	.3890	8.20	3.38	30.62	1.53	20.66	21.54	6.4	8.0	6.9	66.0
	825	.3969	6.97	3.36	33.21	1.48	27.31	28.29	7.7	9.4	9.1	87.2
	975	.4072	10.18	5.13	43.92	1.77	37.35	34.07	8.4	10.3	11.2	108.6
	1125	.4214	10.19	7.31	57.90	2.00	47.02	40.83	10.4	13.0	13.3	132.0
	1275	.4437	10.45	10.45	65.09	2.11	46.48	46.39	11.2	13.7	14.2	142.9
	1425	.4789	11.77	10.59	51.75	1.39	34.33	42.15	9.2	10.9	12.3	122.3

PREDICTED ION CONCENTRATIONS, ESP, SAR, EC, AND DISSOLVED CATIONS OF THE SOIL PROFILE FOR TREATMENT NO. 60 (WATER TABLE DEPTH 1500 MM; WATER TABLE EC 6 DS/M; CLAY LOAM SOIL; COTTON CROP; 04 DAYS IRRIGATION INTERVAL WITH IRRIGATION APPLICATION AMOUNT AS 0.50 OF ET)

End of Year	Depth (mm)	Theta (cm3/cm3)	Ca	Mg	Na	K	Cl	SO4	ESP	SAR	EC (ds/m)	Diss. Cat. (meq/l)
			mmol/l									
1	75	.3728	1.00	.46	10.01	.62	4.62	3.85	4.9	7.2	1.5	13.5
	225	.3769	3.11	1.32	18.46	1.01	9.34	8.72	5.7	7.7	3.0	28.3
	375	.3810	3.46	1.42	18.97	1.02	9.76	9.53	5.6	7.6	3.2	30.1
	525	.3851	2.63	1.11	16.55	.95	8.12	8.12	5.6	7.6	2.7	25.1
	675	.3903	2.42	1.05	15.89	.89	7.66	7.82	5.6	7.7	2.6	23.9
	825	.3975	3.29	1.40	18.07	.99	9.03	9.94	5.7	7.6	3.2	29.5
	975	.4075	6.48	2.69	24.58	1.35	14.90	17.18	5.8	7.4	5.4	50.5
	1125	.4215	9.93	4.62	37.19	1.74	28.91	29.78	7.4	9.1	9.5	91.4
	1275	.4437	11.28	7.61	54.64	2.11	41.62	37.04	9.7	12.1	12.1	119.1
	1425	.4789	12.07	9.20	48.58	1.58	32.55	37.70	8.7	10.5	11.3	111.0
2	75	.3672	.99	.46	9.03	.61	4.32	3.41	4.5	6.6	1.4	12.5
	225	.3714	3.15	1.30	18.95	1.00	9.75	8.59	5.8	7.8	3.1	28.9
	375	.3762	5.21	2.18	24.10	1.24	13.37	12.59	5.9	7.9	4.2	40.0
	525	.3818	5.52	2.29	23.74	1.26	13.73	13.73	5.8	7.5	4.5	42.6
	675	.3885	6.58	2.73	24.96	1.36	16.21	16.62	5.8	7.3	5.4	50.8
	825	.3966	9.34	3.93	31.47	1.56	24.75	23.68	6.3	7.8	7.8	74.2
	975	.4071	10.60	5.30	45.17	1.77	39.11	31.71	8.4	10.3	10.9	105.4
	1125	.4213	10.36	8.18	64.94	2.09	53.01	40.48	11.2	14.1	13.8	137.3
	1275	.4436	10.27	12.19	74.61	2.29	54.08	48.39	12.3	15.1	15.2	153.7
	1425	.4789	11.77	12.37	59.66	1.39	41.66	44.13	10.2	12.1	13.3	133.9
3	75	.3824	2.61	1.11	13.98	.87	7.74	6.40	4.7	6.6	2.6	22.4
	225	.3804	5.03	2.12	23.34	1.26	13.52	11.95	5.9	7.8	4.2	38.9
	375	.3793	7.05	2.90	28.06	1.41	17.63	16.38	6.1	7.8	5.5	52.0
	525	.3827	8.62	3.56	29.81	1.50	21.67	19.85	6.0	7.6	6.7	63.3
	675	.3888	10.60	4.42	34.78	1.69	30.04	24.42	6.5	8.0	8.5	81.1
	825	.3969	11.15	5.41	47.23	1.80	44.61	28.05	8.4	10.5	10.7	103.4
	975	.4072	10.18	7.82	68.99	2.02	62.43	39.79	11.8	14.9	14.7	145.2
	1125	.4214	9.58	13.41	91.77	2.44	73.05	53.89	14.2	17.8	18.0	184.7
	1275	.4437	9.90	17.14	90.57	2.29	62.34	58.67	13.8	16.7	17.6	183.8
	1425	.4789	11.58	13.56	60.06	1.29	39.38	45.71	10.1	11.9	13.3	134.5

PREDICTED ION CONCENTRATIONS, ESP, SAR, EC, AND DISSOLVED CATIONS OF THE SOIL PROFILE FOR TREATMENT NO. 61 (WATER TABLE DEPTH 1500 MM; WATER TABLE EC 6 DS/M; CLAY LOAM SOIL; WHEAT CROP; 14 DAYS IRRIGATION INTERVAL WITH IRRIGATION APPLICATION AMOUNT AS 0.75 OF ET)

End of Year	Depth (mm)	Theta (cm3/cm3)	Ca	Mg	Na	K	Cl	SO4	ESP	SAR	EC (ds/m)	Diss. Cat. (meq/l)
			mmol/l									
1	75	.3947	.08	.00	2.12	.16	.90	.49	4.6	7.8	.3	2.4
	225	.4009	.08	.08	3.64	.25	1.49	.99	5.3	8.7	.5	4.1
	375	.4058	.34	.17	6.46	.34	2.68	2.18	5.7	8.9	.9	7.7
	525	.4093	.85	.34	10.15	.59	4.31	3.97	5.8	8.7	1.5	13.0
	675	.4120	1.53	.68	13.53	.77	6.13	5.87	6.0	8.5	2.1	18.6
	825	.4146	2.23	.94	16.02	.86	7.62	7.45	6.0	8.4	2.6	23.5
	975	.4185	3.20	1.30	18.59	1.04	9.34	9.68	6.0	8.1	3.2	29.6
	1125	.4269	5.91	2.47	25.40	1.32	14.29	16.41	6.4	8.2	5.2	48.6
	1275	.4460	11.24	5.71	42.02	1.94	26.08	31.70	8.0	9.9	9.6	92.5
	1425	.4794	12.08	8.42	48.04	1.68	30.51	37.64	8.7	10.5	11.1	109.2
2	75	.3948	.08	.00	1.79	.16	.82	.33	3.9	6.7	.3	2.0
	225	.4011	.08	.00	2.57	.17	1.08	.58	5.0	8.5	.3	2.9
	375	.4060	.08	.08	3.94	.25	1.59	1.01	5.5	9.1	.5	4.4
	525	.4096	.25	.08	6.09	.34	2.54	1.86	5.8	9.1	.8	7.2
	675	.4124	.60	.26	9.12	.51	3.92	3.32	5.9	8.9	1.3	11.4
	825	.4150	1.46	.60	13.12	.77	6.00	5.74	5.9	8.5	2.0	18.1
	975	.4190	3.29	1.39	19.56	1.04	10.04	10.56	6.2	8.4	3.6	32.4
	1125	.4272	7.24	3.44	33.01	1.50	19.24	20.74	7.5	9.5	6.8	63.9
	1275	.4461	10.88	8.11	55.67	2.03	34.66	37.88	10.0	12.4	11.5	113.7
	1425	.4795	11.89	10.80	59.05	1.59	38.34	42.30	10.2	12.3	12.6	126.7
3	75	.3948	.08	.00	1.71	.16	.73	.33	3.3	5.5	.3	2.0
	225	.4012	.08	.00	2.32	.17	.99	.50	4.7	8.1	.3	2.6
	375	.4061	.08	.00	3.27	.17	1.34	.76	5.5	9.1	.4	3.7
	525	.4098	.17	.08	4.74	.25	2.03	1.27	5.7	9.2	.7	5.5
	675	.4126	.43	.17	7.08	.43	3.07	2.39	5.7	8.8	1.0	8.6
	825	.4153	1.03	.43	11.07	.60	5.15	4.81	5.8	8.5	1.8	15.3
	975	.4192	2.68	1.21	18.97	.95	9.96	10.31	6.7	9.0	3.6	31.9
	1125	.4274	6.36	3.71	35.68	1.50	20.66	22.43	8.4	10.8	7.4	68.8
	1275	.4462	10.33	9.50	61.68	2.03	37.34	42.50	11.0	13.5	12.7	125.8
	1425	.4795	11.49	12.19	64.99	1.59	41.61	46.66	11.1	13.3	13.7	138.8

PREDICTED ION CONCENTRATIONS, ESP, SAR, EC, AND DISSOLVED CATIONS OF THE SOIL PROFILE FOR TREATMENT NO. 62 (WATER TABLE DEPTH 1500 MM; WATER TABLE EC 6 DS/M; CLAY LOAM SOIL; WHEAT CROP; 14 DAYS IRRIGATION INTERVAL WITH IRRIGATION APPLICATION AMOUNT AS 0.50 OF ET)

End of Year	Depth (mm)	Theta (cm3/cm3)	Ca	Mg	Na	K	Cl	SO4	ESP	SAR	EC (ds/m)	Diss. Cat. (meq/l)
			mmol/l									
1	75	.3904	.16	.08	4.36	.24	1.77	1.37	4.8	7.7	.6	5.2
	225	.3958	.65	.25	8.50	.49	3.60	3.19	5.4	8.1	1.2	10.8
	375	.3994	1.49	.66	13.20	.74	6.02	5.69	5.8	8.3	2.0	18.3
	525	.4013	2.40	.99	16.33	.91	7.88	7.71	5.9	8.1	2.7	24.3
	675	.4028	2.75	1.17	17.48	1.00	8.57	8.57	5.8	8.1	2.9	26.5
	825	.4055	3.10	1.26	18.18	1.01	9.13	9.30	5.9	8.0	3.1	28.5
	975	.4117	5.02	2.04	22.37	1.28	12.59	13.52	6.0	7.7	4.4	40.7
	1125	.4233	10.41	4.46	35.68	1.75	25.36	25.98	7.0	8.7	8.3	79.4
	1275	.4444	11.20	7.80	58.12	2.11	43.61	38.29	10.3	12.9	12.5	123.6
	1425	.4791	11.98	10.10	54.54	1.68	37.52	40.58	9.5	11.5	12.3	122.2
2	75	.3908	.16	.08	3.79	.24	1.61	1.05	4.4	7.2	.5	4.5
	225	.3962	.49	.25	7.45	.41	3.19	2.54	5.2	7.9	1.1	9.3
	375	.3999	1.32	.58	12.31	.66	5.62	4.96	5.7	8.3	1.9	16.7
	525	.4020	2.49	1.00	16.94	.91	8.39	7.81	6.0	8.2	2.7	25.0
	675	.4035	4.00	1.67	21.01	1.17	11.50	11.25	6.0	8.0	3.8	35.3
	825	.4062	6.55	2.69	26.44	1.43	16.87	16.87	6.2	8.0	5.6	52.2
	975	.4121	9.79	4.34	37.72	1.70	28.86	27.08	7.5	9.3	9.0	85.8
	1125	.4235	10.50	7.44	61.51	2.01	49.61	39.29	10.9	13.7	13.3	131.4
	1275	.4445	10.19	13.32	85.13	2.39	64.47	53.27	13.6	16.8	17.1	174.8
	1425	.4791	11.58	13.36	66.32	1.58	46.92	47.32	11.1	13.2	14.4	145.3
3	75	.3909	.16	.08	3.72	.24	1.62	1.05	4.0	6.5	.5	4.4
	225	.3964	.57	.25	7.37	.49	3.36	2.54	4.9	7.5	1.1	9.3
	375	.4001	1.41	.58	12.65	.74	6.20	5.21	5.6	8.1	2.0	17.5
	525	.4022	3.16	1.33	18.70	1.00	10.39	9.22	6.0	8.1	3.3	29.9
	675	.4038	5.67	2.34	25.45	1.33	16.69	14.93	6.3	8.3	5.2	48.1
	825	.4065	8.73	3.78	35.53	1.60	27.21	23.26	7.4	9.2	8.0	75.9
	975	.4123	10.39	6.22	55.20	1.87	45.23	35.35	10.1	12.6	12.2	118.9
	1125	.4236	9.80	11.55	85.07	2.36	68.88	50.59	13.7	17.3	17.2	173.8
	1275	.4445	9.64	18.46	104.88	2.48	78.80	64.47	15.5	19.0	20.4	212.1
	1425	.4791	11.28	15.64	74.54	1.48	53.16	52.17	12.0	14.2	15.8	161.5

PREDICTED ION CONCENTRATIONS, ESP, SAR, EC, AND DISSOLVED CATIONS OF THE SOIL PROFILE FOR TREATMENT NO. 63 (WATER TABLE DEPTH 1500 MM; WATER TABLE EC 6 DS/M; CLAY LOAM SOIL; WHEAT CROP; 04 DAYS IRRIGATION INTERVAL WITH IRRIGATION APPLICATION AMOUNT AS 0.75 OF ET)

End of Year	Depth (mm)	Theta (cm3/cm3)	Ca	Mg	Na	K	Cl	SO4	ESP	SAR	EC (ds/m)	Diss. Cat. (meq/l)
			-------	-------	-------	mmol/l	-------	-------				
1	75	.3794	.16	.08	3.92	.24	1.65	1.02	4.3	7.1	.6	4.7
	225	.3834	.87	.32	9.98	.55	4.44	3.56	5.5	8.2	1.5	12.9
	375	.3859	2.63	1.12	17.46	.96	8.61	7.97	5.9	8.1	2.8	25.8
	525	.3882	3.61	1.52	19.89	1.04	10.27	10.03	5.9	7.9	3.4	31.5
	675	.3920	3.16	1.30	18.39	.97	9.31	9.23	5.8	7.8	3.1	28.6
	825	.3984	2.88	1.23	17.62	.99	8.73	8.89	5.8	7.9	2.9	27.0
	975	.4079	3.96	1.60	19.72	1.10	10.03	11.21	5.7	7.7	3.6	33.1
	1125	.4216	7.75	3.22	26.92	1.48	15.42	19.51	6.0	7.6	5.9	55.7
	1275	.4438	11.74	5.41	37.69	1.93	25.03	29.98	7.2	8.7	9.1	87.9
	1425	.4789	12.57	7.12	40.27	1.78	26.62	33.15	7.4	9.0	9.9	96.1
2	75	.3817	.24	.08	3.71	.32	1.66	.95	3.8	6.1	.6	4.6
	225	.3860	.88	.40	9.97	.56	4.55	3.43	5.3	8.0	1.5	13.1
	375	.3889	2.89	1.21	19.04	.96	9.56	8.20	6.1	8.4	3.1	28.3
	525	.3913	4.77	2.02	24.09	1.21	12.85	12.13	6.2	8.3	4.1	38.9
	675	.3946	5.63	2.36	24.78	1.30	13.62	14.02	6.0	7.9	4.6	43.0
	825	.4003	6.95	2.89	26.30	1.41	15.30	17.37	6.0	7.6	5.4	51.5
	975	.4089	9.72	4.06	31.26	1.61	20.78	24.75	6.3	7.8	7.6	72.5
	1125	.4221	10.64	5.23	40.20	1.83	29.65	32.79	7.8	9.4	10.1	98.3
	1275	.4440	11.19	7.34	51.10	2.02	37.15	36.79	9.3	11.4	11.6	114.0
	1425	.4790	12.27	9.10	48.10	1.58	32.66	37.61	8.6	10.3	11.3	111.2
3	75	.3834	.24	.08	3.64	.32	1.74	.95	3.3	5.4	.6	4.7
	225	.3881	1.04	.40	10.26	.64	4.81	3.53	5.1	7.6	1.6	13.8
	375	.3912	3.48	1.45	21.01	1.05	10.91	9.30	6.2	8.5	3.5	32.0
	525	.3935	6.67	2.76	28.94	1.46	16.59	15.69	6.6	8.5	5.2	49.7
	675	.3966	8.93	3.69	31.96	1.56	20.24	20.98	6.5	8.1	6.7	64.2
	825	.4016	7.63	3.48	32.61	1.49	24.81	24.89	7.2	9.0	8.2	77.7
	975	.4097	10.50	4.99	41.14	1.78	32.17	31.07	7.9	9.6	10.0	97.3
	1125	.4225	10.56	6.63	52.11	2.01	40.59	36.40	9.5	11.8	11.9	116.6
	1275	.4441	10.74	9.63	61.75	2.11	44.96	42.94	10.6	13.1	13.4	134.3
	1425	.4790	11.88	10.59	53.44	1.48	36.62	41.27	9.4	11.2	12.3	122.8

PREDICTED ION CONCENTRATIONS, ESP, SAR, EC, AND DISSOLVED CATIONS OF THE SOIL PROFILE FOR TREATMENT NO. 64 (WATER TABLE DEPTH 1500 MM; WATER TABLE EC 6 DS/M; CLAY LOAM SOIL; WHEAT CROP; 04 DAYS IRRIGATION INTERVAL WITH IRRIGATION APPLICATION AMOUNT AS 0.50 OF ET)

End of Year	Depth (mm)	Theta (cm3/cm3)	Ca	Mg	Na	K	Cl	SO4	ESP	SAR	EC (ds/m)	Diss. Cat. (meq/l)
			mmol/l									
1	75	.3817	.55	.24	6.94	.47	3.08	2.37	4.7	7.2	1.0	8.9
	225	.3858	1.91	.80	14.59	.80	6.93	6.30	5.7	8.0	2.3	20.7
	375	.3880	2.97	1.20	17.96	.96	8.98	8.74	5.8	7.9	3.0	27.8
	525	.3896	2.74	1.13	17.07	.97	8.45	8.37	5.6	7.7	2.8	26.1
	675	.3927	2.52	1.05	16.23	.89	7.87	7.95	5.7	7.8	2.6	24.3
	825	.3986	3.05	1.24	17.79	.99	8.81	9.22	5.7	7.7	3.0	27.8
	975	.4079	5.90	2.44	23.68	1.35	13.82	15.34	5.8	7.6	4.9	45.5
	1125	.4216	9.49	4.36	35.80	1.66	27.35	28.22	7.3	9.0	9.1	86.8
	1275	.4438	11.37	7.43	55.02	2.11	42.00	36.49	9.7	12.1	12.0	118.2
	1425	.4789	12.17	9.30	49.47	1.68	33.05	38.00	8.8	10.6	11.4	112.4
2	75	.3823	.71	.32	7.66	.47	3.55	2.69	4.4	6.6	1.2	10.3
	225	.3865	2.56	1.12	17.17	.96	8.62	7.43	5.7	8.0	2.8	25.5
	375	.3888	4.26	1.77	22.01	1.12	11.73	11.01	6.0	8.0	3.8	35.1
	525	.3904	4.52	1.86	21.94	1.21	12.10	11.94	5.9	7.7	4.0	37.3
	675	.3934	5.61	2.36	23.41	1.30	14.39	14.71	5.8	7.5	4.8	45.0
	825	.3991	8.49	3.55	29.52	1.48	22.26	22.35	6.2	7.7	7.3	69.0
	975	.4082	10.04	4.89	42.00	1.69	36.69	32.89	8.2	10.0	10.9	105.5
	1125	.4217	10.54	7.58	63.17	2.09	53.41	38.95	11.0	13.9	13.6	134.5
	1275	.4438	10.45	12.47	78.12	2.29	57.31	49.24	12.7	15.7	15.7	159.5
	1425	.4789	11.77	11.87	56.30	1.48	36.71	42.74	9.7	11.5	12.5	125.9
3	75	.3826	1.03	.47	8.62	.55	4.27	3.24	4.3	6.2	1.4	12.1
	225	.3868	3.76	1.60	20.22	1.12	11.11	9.51	5.8	7.9	3.5	31.9
	375	.3891	6.59	2.73	27.74	1.45	16.96	15.52	6.3	8.1	5.3	49.7
	525	.3908	8.24	3.39	29.55	1.53	20.67	19.46	6.2	7.8	6.5	61.4
	675	.3937	10.17	4.23	33.51	1.63	27.82	24.40	6.4	8.0	8.3	79.0
	825	.3993	10.97	5.11	44.30	1.82	40.84	28.38	8.1	10.1	10.5	100.4
	975	.4083	10.21	7.09	63.61	2.02	56.94	38.30	11.1	14.1	13.9	136.7
	1125	.4218	9.67	11.94	86.02	2.35	69.37	50.98	13.7	17.3	17.2	174.8
	1275	.4438	9.90	16.78	91.60	2.38	64.64	58.50	13.9	17.0	17.9	185.8
	1425	.4789	11.58	13.36	59.66	1.29	38.49	45.42	10.1	11.9	13.1	133.0

PREDICTED ION CONCENTRATIONS, ESP, SAR, EC, AND DISSOLVED CATIONS OF THE SOIL PROFILE FOR TREATMENT NO. 65 (WATER TABLE DEPTH 2000 MM; WATER TABLE EC 2 DS/M; SANDY LOAM SOIL; COTTON CROP; 14 DAYS IRRIGATION INTERVAL WITH IRRIGATION APPLICATION AMOUNT AS 0.75 OF ET)

End of	Depth	Theta	Ca	Mg	Na	K	Cl	SO4	ESP	SAR	EC	Diss. Cat.
Year	(mm)	(cm3/cm3)	mmol/l								(ds/m)	(meq/l)
1	100	.3106	.13	.06	3.21	.19	1.35	.90	3.9	6.2	.4	3.8
	300	.3174	.66	.26	7.94	.46	3.48	2.95	4.5	6.6	1.1	10.2
	500	.3244	1.88	.80	13.40	.74	6.50	6.03	4.8	6.6	2.1	19.6
	700	.3295	2.72	1.16	15.79	.89	8.03	7.76	4.9	6.6	2.7	24.7
	900	.3310	2.53	1.03	14.98	.82	7.52	7.45	4.8	6.6	2.5	23.2
	1100	.3337	2.07	.90	13.65	.76	6.62	6.62	4.8	6.6	2.2	20.3
	1300	.3412	1.90	.78	13.32	.78	6.34	6.34	4.9	6.8	2.1	19.5
	1500	.3553	2.28	.95	14.61	.81	7.19	7.05	5.1	7.0	2.4	21.8
	1700	.3808	4.41	1.89	20.85	1.18	11.57	10.31	5.5	7.4	3.8	34.5
	1900	.4447	6.52	2.76	21.32	1.47	14.06	10.57	5.0	6.7	4.7	41.4
2	100	.3147	.07	.00	1.95	.13	.85	.39	3.3	5.5	.3	2.2
	300	.3221	.13	.07	3.59	.20	1.53	.87	4.3	7.1	.5	4.1
	500	.3282	.47	.20	7.32	.41	3.19	2.31	4.7	7.3	1.0	9.1
	700	.3328	1.44	.62	12.51	.69	5.91	4.95	5.0	7.2	1.9	17.3
	900	.3367	2.71	1.11	16.49	.90	8.42	7.65	5.1	7.0	2.7	25.1
	1100	.3409	3.24	1.34	17.54	.92	9.16	8.73	5.1	6.8	3.0	27.8
	1300	.3470	3.15	1.29	17.13	.93	8.89	8.68	5.1	6.8	2.9	27.1
	1500	.3581	3.77	1.55	18.72	1.04	10.06	9.40	5.2	7.0	3.3	30.3
	1700	.3813	6.62	2.76	25.05	1.42	15.20	12.60	5.5	7.2	4.9	45.3
	1900	.4450	9.56	4.14	25.38	1.75	18.39	13.79	5.0	6.5	6.1	54.3
3	100	.3224	.13	.07	2.40	.20	1.07	.53	2.9	4.9	.4	2.9
	300	.3266	.20	.07	4.25	.27	1.89	.94	4.3	6.9	.6	5.0
	500	.3255	.54	.20	7.53	.40	3.36	2.15	4.7	7.3	1.1	9.3
	700	.3216	1.33	.60	11.96	.60	5.65	4.45	4.9	7.0	1.8	16.4
	900	.3209	2.52	1.06	15.71	.80	7.96	7.03	5.0	6.8	2.6	23.7
	1100	.3266	3.31	1.42	17.54	.94	9.24	8.64	4.9	6.6	3.0	27.9
	1300	.3376	4.05	1.67	19.11	1.05	10.46	9.77	5.0	6.7	3.4	31.6
	1500	.3540	6.58	2.71	24.43	1.32	14.77	12.80	5.2	6.9	4.8	44.3
	1700	.3806	12.42	5.27	34.29	1.97	24.06	18.40	5.7	7.2	7.6	71.5
	1900	.4446	10.38	4.59	24.71	1.75	19.11	13.41	4.7	6.2	6.3	56.4

PREDICTED ION CONCENTRATIONS, ESP, SAR, EC, AND DISSOLVED CATIONS OF THE SOIL PROFILE FOR TREATMENT NO. 66 (WATER TABLE DEPTH 2000 MM; WATER TABLE EC 2 DS/M; SANDY LOAM SOIL; COTTON CROP; 14 DAYS IRRIGATION INTERVAL WITH IRRIGATION APPLICATION AMOUNT AS 0.50 OF ET)

End of Year	Depth (mm)	Theta (cm3/cm3)	Ca	Mg	Na	K	Cl	SO4	ESP	SAR	EC (ds/m)	Diss. Cat. (meq/l)
			mmol/l									
1	100	.2844	.65	.29	7.05	.41	3.23	2.70	3.8	5.5	1.1	9.4
	300	.2943	1.88	.79	12.53	.67	6.14	5.78	4.3	5.9	2.0	18.7
	500	.3010	2.36	1.00	13.99	.75	7.09	6.90	4.4	6.0	2.4	22.1
	700	.3074	1.91	.83	12.58	.70	6.10	6.10	4.4	6.1	2.1	19.1
	900	.3148	1.63	.72	11.90	.65	5.66	5.66	4.5	6.2	1.9	17.3
	1100	.3239	1.67	.67	12.05	.67	5.69	5.69	4.6	6.4	1.9	17.4
	1300	.3359	1.80	.76	12.91	.69	6.18	6.11	4.8	6.7	2.1	18.8
	1500	.3528	2.92	1.24	16.40	.95	8.46	8.02	5.0	6.9	2.8	25.5
	1700	.3802	7.86	3.30	27.57	1.49	17.28	13.98	5.6	7.3	5.5	51.3
	1900	.4443	8.72	3.76	22.58	1.65	16.80	11.57	4.6	6.2	5.6	49.3
2	100	.3071	.25	.13	4.19	.25	1.84	1.21	3.6	5.6	.6	5.2
	300	.3131	1.04	.45	9.83	.52	4.59	3.69	4.5	6.5	1.5	13.3
	500	.3179	2.50	1.05	15.44	.79	7.82	7.03	4.9	6.6	2.5	23.3
	700	.3214	2.92	1.20	16.07	.86	8.37	7.97	4.8	6.4	2.7	25.4
	900	.3252	2.35	1.01	14.38	.81	7.19	7.12	4.7	6.4	2.4	22.1
	1100	.3309	2.19	.89	13.88	.75	6.77	6.70	4.7	6.6	2.3	20.8
	1300	.3402	3.02	1.27	16.31	.91	8.58	8.01	4.8	6.6	2.8	25.8
	1500	.3551	6.16	2.57	23.62	1.32	15.33	12.55	5.2	6.8	4.5	42.4
	1700	.3808	8.73	4.25	33.28	1.73	26.83	19.12	6.4	8.2	7.1	67.6
	1900	.4447	11.94	5.24	25.18	1.84	22.05	14.70	4.5	5.8	6.8	61.4
3	100	.3144	.45	.19	5.46	.39	2.60	1.69	3.4	5.3	.9	7.3
	300	.3166	1.24	.52	10.53	.59	5.04	3.86	4.4	6.5	1.6	14.6
	500	.3139	2.46	1.04	15.37	.78	7.78	6.81	4.8	6.6	2.5	23.2
	700	.3124	2.90	1.23	16.07	.84	8.39	7.87	4.7	6.3	2.7	25.2
	900	.3165	2.62	1.11	14.91	.85	7.65	7.45	4.6	6.2	2.5	23.3
	1100	.3250	2.82	1.14	15.44	.87	8.13	7.65	4.7	6.3	2.6	24.2
	1300	.3371	4.74	1.95	20.06	1.11	12.40	10.45	4.9	6.5	3.7	34.7
	1500	.3538	9.72	4.17	30.85	1.61	23.90	16.52	5.5	7.1	6.3	60.2
	1700	.3806	13.37	7.16	43.17	2.28	37.35	19.82	6.4	8.4	9.1	86.5
	1900	.4446	12.22	5.60	25.54	1.84	23.06	14.33	4.4	5.8	6.9	62.8

PREDICTED ION CONCENTRATIONS, ESP, SAR, EC, AND DISSOLVED CATIONS OF THE SOIL PROFILE FOR TREATMENT NO. 67 (WATER TABLE DEPTH 2000 MM; WATER TABLE EC 2 DS/M; SANDY LOAM SOIL; COTTON CROP; 04 DAYS IRRIGATION INTERVAL WITH IRRIGATION APPLICATION AMOUNT AS 0.75 OF ET)

End of Year	Depth (mm)	Theta (cm3/cm3)	Ca	Mg	Na	K	Cl	SO4	ESP	SAR	EC (ds/m)	Diss. Cat. (meq/l)
			mmol/l									
1	100	.3089	1.34	.57	10.47	.64	5.04	4.28	4.2	6.0	1.6	14.9
	300	.3053	2.40	1.01	14.13	.76	7.19	6.81	4.5	6.1	2.4	22.1
	500	.3044	1.76	.75	12.08	.69	5.85	5.79	4.3	6.0	2.0	18.4
	700	.3085	1.53	.64	11.28	.64	5.29	5.29	4.4	6.1	1.8	16.4
	900	.3153	1.50	.65	11.34	.65	5.34	5.34	4.5	6.3	1.8	16.4
	1100	.3244	1.61	.67	11.80	.67	5.56	5.56	4.6	6.4	1.9	17.0
	1300	.3365	1.81	.76	12.86	.70	6.12	6.12	4.8	6.7	2.0	18.7
	1500	.3536	3.00	1.24	16.58	.95	8.62	8.11	5.0	6.9	2.8	25.9
	1700	.3805	7.78	3.30	27.52	1.49	17.30	13.91	5.6	7.3	5.5	51.2
	1900	.4446	8.63	3.77	22.32	1.65	16.63	11.39	4.6	6.1	5.5	48.8
2	100	.2987	1.23	.56	9.44	.56	4.69	3.52	3.8	5.6	1.5	13.6
	300	.3040	3.01	1.26	16.14	.88	8.60	7.47	4.6	6.2	2.8	25.6
	500	.3097	2.62	1.09	14.65	.83	7.55	7.17	4.5	6.1	2.5	22.9
	700	.3153	1.89	.78	12.51	.72	6.06	5.99	4.5	6.2	2.0	18.8
	900	.3211	1.72	.73	12.21	.66	5.84	5.77	4.6	6.4	2.0	17.9
	1100	.3286	2.04	.88	13.37	.75	6.52	6.38	4.7	6.4	2.2	19.9
	1300	.3391	3.43	1.40	17.17	.98	9.25	8.41	4.8	6.5	3.0	27.7
	1500	.3546	7.40	3.08	25.64	1.39	16.78	13.26	5.2	6.8	5.2	48.1
	1700	.3807	12.11	5.43	35.32	1.97	27.29	19.03	5.8	7.5	7.7	72.4
	1900	.4447	11.85	5.24	23.98	1.84	20.86	13.69	4.2	5.6	6.6	60.0
3	100	.3083	1.91	.83	11.47	.70	6.18	4.52	3.9	5.5	2.0	17.6
	300	.2963	3.18	1.35	16.59	.86	9.00	7.53	4.5	6.1	2.9	26.4
	500	.3007	2.73	1.12	14.97	.81	7.83	7.27	4.4	6.0	2.5	23.6
	700	.3073	2.03	.89	12.95	.70	6.41	6.22	4.4	6.0	2.1	19.6
	900	.3151	1.95	.85	12.89	.72	6.32	6.18	4.5	6.2	2.1	19.2
	1100	.3246	2.75	1.14	15.22	.87	7.98	7.38	4.6	6.3	2.6	23.9
	1300	.3367	5.57	2.30	21.50	1.18	13.36	10.85	4.8	6.4	4.2	38.4
	1500	.3537	11.47	4.90	32.96	1.75	25.29	16.52	5.4	6.9	7.2	67.3
	1700	.3805	14.94	7.63	43.00	2.36	37.26	18.00	6.1	8.0	9.5	90.4
	1900	.4446	12.49	5.70	24.71	1.84	22.51	13.69	4.2	5.5	6.9	62.9

PREDICTED ION CONCENTRATIONS, ESP, SAR, EC, AND DISSOLVED CATIONS OF THE SOIL PROFILE FOR TREATMENT NO. 68 (WATER TABLE DEPTH 2000 MM; WATER TABLE EC 2 DS/M; SANDY LOAM SOIL; COTTON CROP; 04 DAYS IRRIGATION INTERVAL WITH IRRIGATION APPLICATION AMOUNT AS 0.50 OF ET)

End of Year	Depth (mm)	Theta (cm3/cm3)	Ca	Mg	Na	K	Cl	SO4	ESP	SAR	EC (ds/m)	Diss. Cat. (meq/l)
			mmol/l									
1	100	.3089	1.34	.57	10.47	.64	5.04	4.28	4.2	6.0	1.6	14.9
	300	.3053	2.40	1.01	14.13	.76	7.19	6.81	4.5	6.1	2.4	22.1
	500	.3044	1.76	.75	12.08	.69	5.85	5.79	4.3	6.0	2.0	18.4
	700	.3085	1.53	.64	11.28	.64	5.29	5.29	4.4	6.1	1.8	16.4
	900	.3153	1.50	.65	11.34	.65	5.34	5.34	4.5	6.3	1.8	16.4
	1100	.3244	1.61	.67	11.80	.67	5.56	5.56	4.6	6.4	1.9	17.0
	1300	.3365	1.81	.76	12.86	.70	6.12	6.12	4.8	6.7	2.0	18.7
	1500	.3536	3.00	1.24	16.58	.95	8.62	8.11	5.0	6.9	2.8	25.9
	1700	.3805	7.78	3.30	27.52	1.49	17.30	13.91	5.6	7.3	5.5	51.2
	1900	.4446	8.63	3.77	22.32	1.65	16.63	11.39	4.6	6.1	5.5	48.8
2	100	.2987	1.23	.56	9.44	.56	4.69	3.52	3.8	5.6	1.5	13.6
	300	.3040	3.01	1.26	16.14	.88	8.60	7.47	4.6	6.2	2.8	25.6
	500	.3097	2.62	1.09	14.65	.83	7.55	7.17	4.5	6.1	2.5	22.9
	700	.3153	1.89	.78	12.51	.72	6.06	5.99	4.5	6.2	2.0	18.8
	900	.3211	1.72	.73	12.21	.66	5.84	5.77	4.6	6.4	2.0	17.9
	1100	.3286	2.04	.88	13.37	.75	6.52	6.38	4.7	6.4	2.2	19.9
	1300	.3391	3.43	1.40	17.17	.98	9.25	8.41	4.8	6.5	3.0	27.7
	1500	.3546	7.40	3.08	25.64	1.39	16.78	13.26	5.2	6.8	5.2	48.1
	1700	.3807	12.11	5.43	35.32	1.97	27.29	19.03	5.8	7.5	7.7	72.4
	1900	.4447	11.85	5.24	23.98	1.84	20.86	13.69	4.2	5.6	6.6	60.0
3	100	.3083	1.91	.83	11.47	.70	6.18	4.52	3.9	5.5	2.0	17.6
	300	.2963	3.18	1.35	16.59	.86	9.00	7.53	4.5	6.1	2.9	26.4
	500	.3007	2.73	1.12	14.97	.81	7.83	7.27	4.4	6.0	2.5	23.6
	700	.3073	2.03	.89	12.95	.70	6.41	6.22	4.4	6.0	2.1	19.6
	900	.3151	1.95	.85	12.89	.72	6.32	6.18	4.5	6.2	2.1	19.2
	1100	.3246	2.75	1.14	15.22	.87	7.98	7.38	4.6	6.3	2.6	23.9
	1300	.3367	5.57	2.30	21.50	1.18	13.36	10.85	4.8	6.4	4.2	38.4
	1500	.3537	11.47	4.90	32.96	1.75	25.29	16.52	5.4	6.9	7.2	67.3
	1700	.3805	14.94	7.63	43.00	2.36	37.26	18.00	6.1	8.0	9.5	90.4
	1900	.4446	12.49	5.70	24.71	1.84	22.51	13.69	4.2	5.5	6.9	62.9

PREDICTED ION CONCENTRATIONS, ESP, SAR, EC, AND DISSOLVED CATIONS OF THE SOIL PROFILE
FOR TREATMENT NO. 69 (WATER TABLE DEPTH 2000 MM; WATER TABLE EC 2 DS/M; SANDY LOAM SOIL;
WHEAT CROP; 14 DAYS IRRIGATION INTERVAL WITH IRRIGATION APPLICATION AMOUNT AS 0.75 OF ET)

End of Year	Depth (mm)	Theta (cm3/cm3)	Ca	Mg	Na	K	Cl	SO4	ESP	SAR	EC (ds/m)	Diss. Cat. (meq/l)
			mmol/l									
1	100	.3530	.07	.00	2.84	.22	1.17	.73	4.2	7.1	.4	3.3
	300	.3593	.45	.22	7.28	.45	3.12	2.52	5.0	7.6	1.0	9.1
	500	.3507	1.81	.72	13.55	.72	6.45	5.94	5.2	7.3	2.1	19.4
	700	.3333	2.82	1.17	16.25	.90	8.26	8.06	5.0	6.7	2.8	25.6
	900	.3295	2.66	1.09	15.32	.82	7.69	7.62	4.8	6.5	2.6	23.8
	1100	.3354	2.15	.90	13.93	.76	6.79	6.79	4.8	6.7	2.3	20.9
	1300	.3441	1.92	.78	13.51	.78	6.47	6.47	4.9	6.8	2.2	19.8
	1500	.3570	2.29	.96	14.83	.81	7.30	7.15	5.1	7.1	2.4	22.1
	1700	.3811	4.80	2.05	21.73	1.18	12.28	10.79	5.5	7.4	4.0	36.6
	1900	.4449	7.08	3.03	21.88	1.56	14.89	11.03	4.9	6.6	5.0	43.7
2	100	.3540	.07	.00	2.41	.15	1.02	.51	3.7	6.3	.3	2.8
	300	.3618	.22	.07	5.31	.30	2.32	1.50	4.9	7.8	.8	6.4
	500	.3563	1.03	.44	10.82	.59	4.93	3.90	5.3	7.7	1.7	14.4
	700	.3410	2.40	.99	15.78	.85	7.82	7.05	5.2	7.2	2.6	23.4
	900	.3352	3.12	1.32	17.18	.90	8.86	8.52	5.1	6.8	2.9	26.9
	1100	.3391	2.94	1.19	16.25	.91	8.34	8.20	5.0	6.7	2.7	25.5
	1300	.3463	2.79	1.14	15.96	.86	8.09	7.94	5.0	6.8	2.7	24.7
	1500	.3580	4.14	1.70	19.53	1.11	10.73	9.76	5.2	7.0	3.5	32.4
	1700	.3813	9.37	3.94	29.78	1.65	19.62	15.36	5.6	7.2	6.3	58.1
	1900	.4450	10.39	4.51	24.55	1.75	19.03	13.33	4.6	6.1	6.2	56.1
3	100	.3545	.07	.00	2.12	.15	.95	.44	3.3	5.6	.3	2.5
	300	.3631	.15	.08	4.50	.30	1.95	1.05	4.7	7.7	.6	5.3
	500	.3596	.67	.30	8.84	.52	4.01	2.75	5.3	8.0	1.3	11.2
	700	.3459	1.72	.71	14.01	.71	6.72	5.43	5.4	7.6	2.2	19.7
	900	.3388	2.87	1.19	17.01	.91	8.68	7.84	5.2	7.1	2.8	26.0
	1100	.3414	3.39	1.41	17.85	.99	9.38	8.89	5.1	6.8	3.1	28.4
	1300	.3478	3.88	1.65	18.90	1.01	10.20	9.56	5.1	6.8	3.3	31.0
	1500	.3587	6.23	2.59	23.72	1.33	14.60	12.45	5.3	6.9	4.6	42.6
	1700	.3814	6.54	3.31	30.26	1.50	25.14	18.75	6.7	8.6	7.0	65.6
	1900	.4451	11.59	5.15	26.21	1.84	22.07	15.27	4.7	6.1	6.8	61.5

PREDICTED ION CONCENTRATIONS, ESP, SAR, EC, AND DISSOLVED CATIONS OF THE SOIL PROFILE FOR TREATMENT NO. 70 (WATER TABLE DEPTH 2000 MM; WATER TABLE EC 2 DS/M; SANDY LOAM SOIL; WHEAT CROP; 14 DAYS IRRIGATION INTERVAL WITH IRRIGATION APPLICATION AMOUNT AS 0.50 OF ET)

End of Year	Depth (mm)	Theta (cm3/cm3)	Ca	Mg	Na	K	Cl	SO4	ESP	SAR	EC (ds/m)	Diss. Cat. (meq/l)
			mmol/l									
1	100	.3415	.28	.14	5.36	.35	2.26	1.76	4.3	6.7	.8	6.6
	300	.3379	1.47	.63	11.94	.63	5.59	5.10	4.9	6.9	1.8	16.8
	500	.3198	2.51	1.06	15.00	.79	7.53	7.33	4.8	6.4	2.5	23.6
	700	.3130	2.20	.91	13.65	.78	6.73	6.73	4.5	6.2	2.3	21.1
	900	.3176	1.84	.79	12.47	.72	5.97	5.97	4.5	6.3	2.0	18.4
	1100	.3257	1.75	.74	12.31	.67	5.85	5.85	4.6	6.5	2.0	17.9
	1300	.3372	1.88	.77	13.03	.70	6.20	6.20	4.8	6.7	2.1	19.0
	1500	.3538	2.85	1.17	16.30	.88	8.41	7.97	5.0	6.9	2.8	25.4
	1700	.3805	7.86	3.30	27.59	1.49	17.30	14.07	5.6	7.3	5.5	51.3
	1900	.4446	9.37	4.04	23.42	1.75	17.64	12.22	4.6	6.2	5.8	51.8
2	100	.3428	.35	.14	5.17	.35	2.27	1.63	4.0	6.3	.8	6.4
	300	.3402	1.41	.63	11.88	.63	5.62	4.71	4.9	7.0	1.8	16.6
	500	.3230	2.74	1.13	16.15	.87	8.28	7.61	4.9	6.7	2.7	24.8
	700	.3154	2.67	1.11	15.25	.85	7.82	7.62	4.6	6.3	2.6	24.0
	900	.3196	2.18	.92	13.60	.73	6.74	6.67	4.6	6.3	2.2	20.7
	1100	.3272	2.03	.88	13.45	.74	6.56	6.49	4.7	6.5	2.2	20.0
	1300	.3382	2.93	1.26	16.07	.91	8.39	7.83	4.8	6.6	2.8	25.4
	1500	.3542	6.73	2.78	24.37	1.32	15.37	12.44	5.1	6.7	4.8	44.9
	1700	.3806	12.98	5.82	37.43	2.04	29.25	19.19	6.0	7.6	8.2	77.1
	1900	.4446	12.49	5.51	25.17	1.93	21.68	14.24	4.3	5.7	6.9	63.2
3	100	.3436	.35	.14	5.04	.35	2.27	1.49	3.8	5.9	.8	6.4
	300	.3418	1.41	.64	11.93	.71	5.79	4.52	4.9	7.0	1.9	16.7
	500	.3254	2.89	1.21	16.88	.87	8.74	7.66	5.0	6.9	2.8	26.0
	700	.3175	3.08	1.31	16.60	.85	8.66	8.20	4.8	6.4	2.8	26.2
	900	.3211	2.65	1.13	14.99	.80	7.63	7.43	4.6	6.4	2.5	23.3
	1100	.3283	2.85	1.15	15.53	.88	8.14	7.60	4.7	6.4	2.7	24.5
	1300	.3388	5.04	2.10	20.44	1.12	12.25	10.29	4.8	6.4	3.9	35.8
	1500	.3545	10.69	4.54	31.28	1.68	23.22	15.97	5.3	6.9	6.8	63.5
	1700	.3807	15.10	7.63	43.97	2.36	38.15	17.93	6.2	8.2	9.7	91.8
	1900	.4446	13.78	6.25	26.55	1.93	24.16	15.06	4.4	5.7	7.5	68.7

PREDICTED ION CONCENTRATIONS, ESP, SAR, EC, AND DISSOLVED CATIONS OF THE SOIL PROFILE FOR TREATMENT NO. 71 (WATER TABLE DEPTH 2000 MM; WATER TABLE EC 2 DS/M; SANDY LOAM SOIL; WHEAT CROP; 04 DAYS IRRIGATION INTERVAL WITH IRRIGATION APPLICATION AMOUNT AS 0.75 OF ET)

End of Year	Depth (mm)	Theta (cm3/cm3)	Ca	Mg	Na	K	Cl	SO4	ESP	SAR	EC (ds/m)	Diss. Cat. (meq/l)
			-----	-----	-----	mmol/l	-----	-----				
1	100	.3249	.47	.20	6.04	.40	2.75	1.88	4.0	6.2	.9	7.7
	300	.3186	2.11	.86	13.96	.72	6.98	6.19	4.7	6.6	2.3	20.7
	500	.3119	2.58	1.10	14.89	.84	7.54	7.35	4.6	6.2	2.5	23.6
	700	.3129	1.94	.84	12.87	.71	6.27	6.21	4.5	6.2	2.1	19.5
	900	.3181	1.71	.72	12.09	.66	5.72	5.72	4.5	6.3	1.9	17.7
	1100	.3261	1.68	.67	12.13	.67	5.73	5.73	4.6	6.5	1.9	17.5
	1300	.3375	1.74	.77	12.62	.70	6.00	6.00	4.8	6.7	2.0	18.3
	1500	.3540	2.19	.95	14.41	.80	7.02	6.95	5.0	7.0	2.3	21.4
	1700	.3806	4.25	1.73	20.29	1.10	11.17	9.99	5.5	7.4	3.6	33.3
	1900	.4446	5.79	2.48	20.03	1.38	12.95	9.74	5.0	6.7	4.3	38.0
2	100	.3305	.55	.20	6.01	.41	2.87	1.84	3.7	5.7	.9	8.0
	300	.3268	2.36	1.01	15.26	.81	7.83	6.28	4.9	6.9	2.5	22.8
	500	.3187	3.23	1.38	17.25	.92	9.15	8.30	4.8	6.5	2.9	27.4
	700	.3172	2.49	1.05	14.48	.79	7.34	7.14	4.6	6.3	2.4	22.5
	900	.3208	1.92	.80	12.86	.73	6.23	6.23	4.6	6.4	2.1	19.2
	1100	.3279	1.83	.75	12.80	.75	6.17	6.10	4.7	6.5	2.0	18.8
	1300	.3385	2.24	.98	14.27	.77	7.06	6.85	4.8	6.6	2.3	21.5
	1500	.3544	3.95	1.61	18.96	1.03	10.40	9.23	5.1	6.9	3.4	31.2
	1700	.3807	8.10	3.38	27.29	1.57	17.54	13.61	5.4	7.2	5.6	51.8
	1900	.4446	8.73	3.77	21.86	1.65	16.44	11.39	4.4	5.9	5.5	48.5
3	100	.3346	.55	.28	5.88	.41	2.90	1.73	3.5	5.3	.9	8.0
	300	.3328	2.48	1.03	15.95	.89	8.32	6.19	5.0	7.0	2.7	23.9
	500	.3241	3.75	1.54	19.15	1.00	10.38	8.91	5.0	6.8	3.3	30.7
	700	.3207	2.98	1.26	16.10	.86	8.42	7.95	4.7	6.4	2.7	25.4
	900	.3232	2.27	.93	14.02	.80	6.94	6.81	4.6	6.3	2.3	21.2
	1100	.3294	2.25	.95	14.09	.82	7.01	6.81	4.7	6.5	2.3	21.3
	1300	.3394	3.30	1.40	16.90	.98	9.05	8.20	4.8	6.6	3.0	27.1
	1500	.3547	6.30	2.64	23.52	1.32	14.36	11.65	5.1	6.7	4.6	42.7
	1700	.3807	11.72	4.96	31.70	1.89	22.65	16.52	5.3	6.9	7.3	66.9
	1900	.4447	10.66	4.69	23.25	1.75	18.93	12.77	4.3	5.7	6.2	55.7

PREDICTED ION CONCENTRATIONS, ESP, SAR, EC, AND DISSOLVED CATIONS OF THE SOIL PROFILE FOR TREATMENT NO. 72 (WATER TABLE DEPTH 2000 MM; WATER TABLE EC 2 DS/M; SANDY LOAM SOIL; WHEAT CROP; 04 DAYS IRRIGATION INTERVAL WITH IRRIGATION APPLICATION AMOUNT AS 0.50 OF ET)

End of Year	Depth (mm)	Theta (cm3/cm3)	Ca	Mg	Na	K	Cl	SO4	ESP	SAR	EC (ds/m)	Diss. Cat. (meq/l)
			mmol/l									
1	100	.3240	.87	.40	8.64	.54	4.02	3.21	4.2	6.3	1.3	11.6
	300	.3137	2.27	.91	13.94	.78	7.00	6.61	4.6	6.3	2.3	21.4
	500	.3056	2.02	.82	12.88	.69	6.31	6.25	4.4	6.1	2.2	20.0
	700	.3084	1.66	.70	11.85	.64	5.67	5.67	4.4	6.1	1.9	17.5
	900	.3151	1.63	.65	11.72	.65	5.53	5.53	4.5	6.2	1.9	17.0
	1100	.3241	1.67	.67	12.05	.67	5.69	5.69	4.6	6.4	1.9	17.4
	1300	.3363	1.81	.76	12.85	.69	6.11	6.11	4.8	6.7	2.0	18.8
	1500	.3534	2.85	1.17	16.28	.88	8.32	7.96	5.0	6.9	2.7	25.3
	1700	.3805	7.63	3.22	27.20	1.49	16.98	13.84	5.6	7.3	5.4	50.4
	1900	.4445	8.82	3.86	22.78	1.65	16.90	11.66	4.6	6.2	5.6	49.8
2	100	.3253	1.28	.54	9.75	.60	4.84	3.70	4.1	6.0	1.6	13.9
	300	.3154	2.93	1.24	16.16	.85	8.47	7.56	4.8	6.5	2.7	25.3
	500	.3065	2.41	1.01	14.19	.76	7.22	6.97	4.5	6.1	2.4	22.2
	700	.3089	1.85	.77	12.38	.70	6.00	5.94	4.4	6.1	2.0	18.6
	900	.3155	1.69	.72	12.12	.65	5.80	5.74	4.5	6.3	1.9	17.7
	1100	.3245	1.94	.80	12.94	.74	6.30	6.17	4.6	6.4	2.1	19.2
	1300	.3366	3.06	1.25	16.20	.90	8.48	7.86	4.8	6.5	2.8	25.7
	1500	.3536	6.94	2.92	24.62	1.39	15.56	12.49	5.1	6.7	4.9	45.6
	1700	.3805	13.21	5.82	36.79	2.04	28.46	18.79	5.8	7.5	8.2	76.9
	1900	.4446	11.85	5.24	24.07	1.84	20.58	13.50	4.2	5.5	6.7	60.2
3	100	.3259	1.55	.67	10.57	.67	5.45	4.04	4.0	5.9	1.8	15.6
	300	.3162	3.59	1.50	18.16	.98	9.93	8.43	4.8	6.5	3.2	29.3
	500	.3071	2.92	1.21	15.67	.82	8.19	7.68	4.6	6.2	2.7	24.7
	700	.3093	2.11	.89	13.16	.70	6.52	6.39	4.5	6.1	2.2	20.0
	900	.3157	2.02	.85	13.05	.72	6.39	6.26	4.5	6.2	2.1	19.5
	1100	.3247	2.82	1.14	15.30	.87	7.98	7.38	4.6	6.3	2.6	24.1
	1300	.3368	5.43	2.30	21.08	1.18	12.87	10.58	4.8	6.3	4.1	37.7
	1500	.3537	11.25	4.75	31.79	1.75	23.53	16.08	5.3	6.8	7.0	65.5
	1700	.3805	15.33	7.55	42.30	2.36	36.40	17.53	6.0	7.9	9.5	90.3
	1900	.4446	13.14	5.97	24.99	1.84	22.69	14.15	4.2	5.5	7.1	64.9

PREDICTED ION CONCENTRATIONS, ESP, SAR, EC, AND DISSOLVED CATIONS OF THE SOIL PROFILE FOR TREATMENT NO. 73 (WATER TABLE DEPTH 2000 MM; WATER TABLE EC 2 DS/M; CLAY LOAM SOIL; COTTON CROP; 14 DAYS IRRIGATION INTERVAL WITH IRRIGATION APPLICATION AMOUNT AS 0.75 OF ET)

End of Year	Depth (mm)	Theta (cm3/cm3)	Ca	Mg	Na	K	Cl	SO4	ESP	SAR	EC (ds/m)	Diss. Cat. (meq/l)
			------	------	------mmol/l	------	------	------				
1	100	.3634	.15	.08	3.53	.23	1.43	.98	4.5	7.4	.5	4.1
	300	.3684	.53	.23	7.84	.46	3.35	2.82	5.0	7.6	1.1	9.9
	500	.3739	1.55	.62	12.98	.70	6.03	5.64	5.4	7.6	2.0	18.2
	700	.3800	2.51	1.02	16.33	.86	8.01	7.69	5.6	7.7	2.6	24.5
	900	.3863	2.79	1.20	17.24	.96	8.54	8.46	5.7	7.7	2.8	26.3
	1100	.3925	2.68	1.14	16.87	.89	8.27	8.27	5.7	7.8	2.8	25.5
	1300	.4001	2.56	1.07	16.45	.91	8.10	8.10	5.7	7.9	2.7	24.8
	1500	.4114	3.06	1.27	17.93	1.02	9.18	8.76	5.8	7.9	3.0	27.6
	1700	.4316	4.99	2.05	22.65	1.34	12.84	11.06	6.0	8.0	4.2	38.1
	1900	.4748	6.18	2.65	19.62	1.47	13.24	10.01	4.8	6.5	4.5	38.8
2	100	.3649	.08	.00	2.04	.15	.90	.45	3.8	6.5	.3	2.3
	300	.3697	.08	.08	3.44	.23	1.45	.84	4.8	7.9	.5	4.0
	500	.3745	.31	.15	6.27	.39	2.63	1.93	5.3	8.3	.9	7.5
	700	.3792	.86	.39	10.42	.55	4.54	3.84	5.6	8.3	1.5	13.5
	900	.3842	1.75	.71	14.53	.79	6.83	6.11	5.7	8.2	2.2	20.4
	1100	.3902	2.74	1.13	17.58	.97	8.71	8.22	5.8	8.0	2.8	26.3
	1300	.3984	3.54	1.48	19.59	1.07	10.12	9.63	5.8	7.9	3.3	30.7
	1500	.4106	4.75	1.95	22.40	1.27	12.30	11.28	5.9	8.0	4.0	37.1
	1700	.4314	7.13	3.03	26.56	1.60	16.31	13.73	6.0	7.8	5.3	48.6
	1900	.4747	9.22	4.02	24.72	1.67	17.85	13.93	5.1	6.8	5.9	52.9
3	100	.3739	.08	.08	2.47	.23	1.08	.54	3.5	5.8	.4	2.9
	300	.3788	.16	.08	3.99	.23	1.72	.94	4.8	7.8	.6	4.6
	500	.3826	.32	.16	6.48	.40	2.77	1.82	5.4	8.5	.9	7.8
	700	.3857	.80	.32	10.20	.56	4.54	3.51	5.7	8.4	1.5	13.1
	900	.3890	1.77	.72	14.63	.80	6.91	5.95	5.9	8.4	2.2	20.3
	1100	.3934	3.01	1.30	18.78	.98	9.51	8.62	5.9	8.2	3.1	28.4
	1300	.4002	4.96	2.07	23.32	1.24	12.82	11.58	6.0	8.0	4.2	38.6
	1500	.4114	8.50	3.57	29.92	1.62	18.61	15.81	6.1	8.0	6.0	55.7
	1700	.4316	12.04	5.08	34.24	2.05	23.72	18.46	6.1	7.8	7.6	70.5
	1900	.4748	9.22	4.02	22.37	1.57	17.07	12.26	4.6	6.1	5.7	50.4

PREDICTED ION CONCENTRATIONS, ESP, SAR, EC, AND DISSOLVED CATIONS OF THE SOIL PROFILE
FOR TREATMENT NO. 74 (WATER TABLE DEPTH 2000 MM; WATER TABLE EC 2 DS/M; CLAY LOAM SOIL;
COTTON CROP; 14 DAYS IRRIGATION INTERVAL WITH IRRIGATION APPLICATION AMOUNT AS 0.50 OF ET)

End of Year	Depth (mm)	Theta (cm3/cm3)	Ca	Mg	Na	K	Cl	SO4	ESP	SAR	EC (ds/m)	Diss. Cat. (meq/l)
			mmol/l									
1	100	.3500	.72	.29	8.39	.51	3.76	3.25	4.6	6.9	1.2	11.1
	300	.3565	1.92	.81	13.85	.74	6.63	6.26	5.2	7.1	2.2	20.3
	500	.3628	2.70	1.12	16.34	.90	8.17	8.02	5.3	7.3	2.7	25.4
	700	.3692	2.52	1.07	15.94	.92	7.86	7.78	5.3	7.3	2.6	24.3
	900	.3761	2.25	.93	15.15	.85	7.30	7.30	5.4	7.5	2.4	22.5
	1100	.3842	2.22	.95	15.08	.87	7.22	7.22	5.5	7.6	2.4	22.1
	1300	.3944	2.61	1.06	16.22	.90	8.07	7.90	5.5	7.7	2.7	24.4
	1500	.4085	4.30	1.77	21.02	1.18	11.56	10.38	5.8	7.8	3.7	34.4
	1700	.4307	8.28	3.47	28.65	1.69	18.33	13.97	6.0	7.9	5.9	53.7
	1900	.4744	7.16	3.14	18.23	1.57	13.72	9.21	4.2	5.7	4.7	40.3
2	100	.3625	.30	.15	4.79	.30	2.10	1.50	4.2	6.7	.7	5.9
	300	.3671	.91	.38	10.01	.61	4.55	3.79	5.1	7.5	1.5	13.3
	500	.3721	2.23	.92	15.76	.85	7.69	6.92	5.5	7.8	2.5	22.9
	700	.3770	3.27	1.40	18.85	1.01	9.58	9.11	5.7	7.7	3.1	29.1
	900	.3823	3.48	1.42	19.11	1.03	9.87	9.64	5.7	7.7	3.2	30.1
	1100	.3888	3.61	1.53	19.44	1.04	10.12	9.80	5.7	7.6	3.3	30.8
	1300	.3975	5.09	2.14	22.75	1.23	12.81	11.42	5.7	7.6	4.2	38.4
	1500	.4102	8.90	3.73	29.75	1.70	19.15	15.00	5.9	7.7	6.1	56.6
	1700	.4313	12.65	5.35	33.24	2.14	24.24	17.20	5.7	7.4	7.8	71.4
	1900	.4746	10.69	4.71	21.57	1.77	18.34	12.26	4.1	5.4	6.1	54.0
3	100	.3697	.61	.23	6.57	.46	3.06	2.22	4.1	6.3	1.0	8.7
	300	.3741	1.31	.54	11.52	.70	5.41	4.41	5.1	7.4	1.8	15.8
	500	.3775	2.50	1.01	16.77	.86	8.27	7.33	5.7	7.9	2.7	24.6
	700	.3805	3.54	1.49	19.97	1.02	10.30	9.67	5.8	7.9	3.3	31.1
	900	.3843	4.29	1.83	21.44	1.11	11.51	10.80	5.8	7.7	3.7	34.8
	1100	.3897	5.64	2.33	23.91	1.29	13.69	12.16	5.7	7.6	4.4	41.1
	1300	.3978	9.04	3.78	30.00	1.64	19.48	15.53	5.8	7.6	6.2	57.4
	1500	.4103	13.90	5.93	37.81	2.12	28.48	19.92	6.1	7.8	8.5	79.7
	1700	.4313	15.77	7.04	37.34	2.41	30.57	20.05	5.7	7.4	9.1	85.5
	1900	.4747	9.81	4.41	19.42	1.57	17.16	10.98	3.8	5.1	5.6	49.5

PREDICTED ION CONCENTRATIONS, ESP, SAR, EC, AND DISSOLVED CATIONS OF THE SOIL PROFILE FOR TREATMENT NO. 75 (WATER TABLE DEPTH 2000 MM; WATER TABLE EC 2 DS/M; CLAY LOAM SOIL; COTTON CROP; 04 DAYS IRRIGATION INTERVAL WITH IRRIGATION APPLICATION AMOUNT AS 0.75 OF ET)

End of Year	Depth (mm)	Theta (cm3/cm3)	Ca	Mg	Na	K	Cl	SO4	ESP	SAR	EC (ds/m)	Diss. Cat. (meq/l)
			-----	-----	-----	mmol/l	-----	-----				
1	100	.3705	.54	.23	7.35	.46	3.29	2.53	4.7	7.1	1.1	9.5
	300	.3733	2.55	1.08	16.66	.93	8.25	7.56	5.6	7.7	2.7	24.8
	500	.3722	3.31	1.38	18.46	1.00	9.46	9.23	5.5	7.5	3.2	29.3
	700	.3730	2.47	1.00	15.64	.85	7.63	7.63	5.4	7.4	2.6	23.7
	900	.3777	2.03	.86	14.44	.78	6.87	6.87	5.4	7.5	2.3	21.1
	1100	.3852	2.07	.88	14.56	.80	6.92	6.92	5.5	7.6	2.3	21.1
	1300	.3953	2.29	.98	15.44	.90	7.51	7.43	5.6	7.7	2.5	22.9
	1500	.4092	3.13	1.27	17.92	1.01	9.30	8.71	5.7	7.9	3.0	27.8
	1700	.4310	4.72	1.96	21.91	1.34	12.47	10.24	5.9	7.9	4.1	36.7
	1900	.4745	5.10	2.16	16.96	1.37	11.27	8.04	4.5	6.3	3.9	32.9
2	100	.3756	.39	.16	5.59	.39	2.56	1.71	4.1	6.4	.9	7.2
	300	.3753	2.02	.85	15.20	.85	7.44	6.05	5.6	8.0	2.4	21.8
	500	.3729	4.16	1.70	21.88	1.16	11.63	10.40	5.9	7.9	3.7	34.7
	700	.3740	3.86	1.62	19.94	1.08	10.59	10.05	5.6	7.5	3.4	31.9
	900	.3789	2.90	1.25	17.22	.94	8.69	8.53	5.5	7.4	2.9	26.5
	1100	.3863	2.79	1.20	16.92	.96	8.46	8.22	5.5	7.6	2.8	25.8
	1300	.3960	3.52	1.47	18.98	1.06	10.06	9.16	5.6	7.7	3.3	30.1
	1500	.4095	5.08	2.12	22.59	1.27	12.94	10.66	5.8	7.8	4.2	38.3
	1700	.4311	6.86	2.94	24.23	1.60	15.41	11.49	5.4	7.3	5.1	45.4
	1900	.4746	7.16	3.14	18.04	1.47	13.63	9.32	4.1	5.6	4.6	39.9
3	100	.3803	.86	.39	7.46	.55	3.77	2.44	3.9	5.8	1.3	10.5
	300	.3691	2.44	1.07	16.32	.92	8.31	6.48	5.5	7.7	2.7	24.2
	500	.3661	4.08	1.74	22.09	1.13	11.80	10.29	5.9	7.9	3.7	34.9
	700	.3706	4.21	1.76	21.13	1.15	11.33	10.57	5.7	7.6	3.6	34.2
	900	.3771	3.66	1.48	19.17	1.01	10.05	9.58	5.5	7.5	3.3	30.5
	1100	.3851	3.90	1.59	19.73	1.11	10.58	9.71	5.6	7.6	3.4	31.8
	1300	.3953	5.47	2.29	23.36	1.31	13.48	11.35	5.7	7.6	4.4	40.2
	1500	.4092	8.37	3.47	28.24	1.61	18.18	13.87	5.7	7.5	5.9	53.7
	1700	.4310	10.51	4.45	28.41	1.96	20.48	14.34	5.3	6.9	6.7	60.3
	1900	.4745	7.84	3.43	17.35	1.47	14.12	9.31	3.8	5.1	4.8	41.4

PREDICTED ION CONCENTRATIONS, ESP, SAR, EC, AND DISSOLVED CATIONS OF THE SOIL PROFILE FOR TREATMENT NO. 76 (WATER TABLE DEPTH 2000 MM; WATER TABLE EC 2 DS/M; CLAY LOAM SOIL; COTTON CROP; 04 DAYS IRRIGATION INTERVAL WITH IRRIGATION APPLICATION AMOUNT AS 0.50 OF ET)

End of Year	Depth (mm)	Theta (cm3/cm3)	Ca	Mg	Na	K	Cl	SO4	ESP	SAR	EC (ds/m)	Diss. Cat. (meq/l)
			mmol/l									
1	100	.3645	1.51	.60	11.90	.68	5.65	4.90	5.0	7.1	1.8	16.8
	300	.3671	3.03	1.29	17.44	.99	8.87	8.49	5.4	7.4	2.9	27.3
	500	.3685	2.36	.99	15.38	.84	7.54	7.46	5.3	7.3	2.6	23.5
	700	.3716	1.92	.77	13.90	.77	6.60	6.60	5.3	7.4	2.2	20.3
	900	.3773	1.87	.78	13.80	.78	6.47	6.47	5.4	7.5	2.2	20.0
	1100	.3850	1.99	.88	14.40	.80	6.84	6.84	5.5	7.6	2.3	20.9
	1300	.3952	2.53	1.06	16.09	.90	8.00	7.84	5.6	7.7	2.6	24.3
	1500	.4092	4.40	1.86	21.31	1.18	11.75	10.40	5.7	7.8	3.8	35.0
	1700	.4310	8.01	3.38	27.96	1.69	17.81	13.54	5.9	7.8	5.8	52.3
	1900	.4745	6.96	3.04	17.84	1.47	13.43	9.02	4.1	5.6	4.6	39.4
2	100	.3581	1.41	.59	10.95	.67	5.33	4.29	4.6	6.7	1.8	15.5
	300	.3623	3.59	1.50	19.69	1.05	10.40	9.28	5.5	7.5	3.3	31.0
	500	.3671	3.56	1.52	18.96	1.06	10.01	9.48	5.5	7.4	3.2	30.2
	700	.3726	2.62	1.08	16.09	.92	8.01	7.85	5.4	7.3	2.7	24.5
	900	.3790	2.43	1.02	15.66	.86	7.75	7.52	5.4	7.4	2.6	23.5
	1100	.3866	3.20	1.36	17.97	1.04	9.35	8.71	5.5	7.5	3.1	28.2
	1300	.3962	5.48	2.29	23.25	1.31	13.51	11.38	5.6	7.5	4.4	40.1
	1500	.4096	9.48	3.98	30.47	1.78	20.06	15.06	5.8	7.6	6.4	59.2
	1700	.4311	12.47	5.26	31.62	2.14	23.60	16.21	5.4	7.0	7.6	69.2
	1900	.4746	9.61	4.22	18.93	1.67	16.38	10.69	3.8	5.0	5.5	48.2
3	100	.3716	2.46	1.07	14.28	.84	7.60	6.14	4.8	6.7	2.5	22.2
	300	.3642	4.06	1.73	20.92	1.13	11.29	9.86	5.6	7.6	3.6	33.5
	500	.3653	3.77	1.58	19.77	1.06	10.49	9.81	5.5	7.4	3.4	31.6
	700	.3705	3.14	1.30	17.61	1.00	9.11	8.73	5.4	7.3	3.0	27.6
	900	.3771	3.51	1.48	18.39	1.01	9.74	8.96	5.4	7.3	3.2	29.3
	1100	.3851	5.33	2.23	22.60	1.27	13.13	11.06	5.5	7.3	4.3	39.1
	1300	.3953	9.47	4.00	30.06	1.72	19.85	15.03	5.6	7.4	6.4	58.6
	1500	.4092	14.88	6.26	37.37	2.20	28.07	18.77	5.7	7.4	8.8	82.0
	1700	.4310	15.67	6.86	34.73	2.40	28.85	17.63	5.3	6.9	8.8	82.4
	1900	.4745	9.61	4.31	18.14	1.57	16.37	10.29	3.6	4.8	5.4	47.6

PREDICTED ION CONCENTRATIONS, ESP, SAR, EC, AND DISSOLVED CATIONS OF THE SOIL PROFILE FOR TREATMENT NO. 77 (WATER TABLE DEPTH 2000 MM; WATER TABLE EC 2 DS/M; CLAY LOAM SOIL; WHEAT CROP; 14 DAYS IRRIGATION INTERVAL WITH IRRIGATION APPLICATION AMOUNT AS 0.75 OF ET)

End of Year	Depth (mm)	Theta (cm3/cm3)	Ca	Mg	Na	K	Cl	SO4	ESP	SAR	EC (ds/m)	Diss. Cat. (meq/l)
			mmol/l									
1	100	.3940	.08	.00	2.77	.16	1.14	.73	4.7	7.9	.4	3.1
	300	.4001	.33	.17	6.12	.33	2.56	2.07	5.5	8.6	.8	7.4
	500	.4015	1.08	.41	11.45	.66	5.06	4.65	5.7	8.4	1.7	15.1
	700	.3976	2.14	.90	15.77	.82	7.48	7.23	5.8	8.1	2.5	23.1
	900	.3911	2.75	1.13	17.29	.97	8.57	8.40	5.7	7.8	2.9	26.3
	1100	.3899	2.74	1.13	17.00	.97	8.38	8.38	5.6	7.7	2.8	25.9
	1300	.3967	2.70	1.15	16.72	.90	8.28	8.20	5.7	7.8	2.7	25.3
	1500	.4096	3.22	1.35	18.28	1.02	9.39	9.06	5.8	8.0	3.1	28.4
	1700	.4311	5.26	2.23	23.60	1.34	13.36	11.67	6.1	8.2	4.3	39.7
	1900	.4746	6.57	2.84	20.49	1.47	13.92	10.69	4.9	6.7	4.7	40.8
2	100	.3944	.08	.00	2.20	.16	.90	.49	4.2	7.1	.3	2.5
	300	.4008	.17	.08	4.14	.25	1.74	1.08	5.2	8.6	.6	4.8
	500	.4029	.50	.17	7.91	.42	3.33	2.58	5.7	8.8	1.1	9.7
	700	.4000	1.24	.58	12.73	.66	5.79	5.04	6.0	8.6	1.9	17.0
	900	.3941	2.36	.98	16.61	.90	7.98	7.49	5.9	8.2	2.6	24.1
	1100	.3923	3.16	1.30	18.64	.97	9.40	9.08	5.8	7.9	3.1	28.5
	1300	.3980	3.78	1.56	20.06	1.07	10.53	10.03	5.8	7.9	3.4	31.8
	1500	.4102	5.17	2.20	23.31	1.27	13.05	11.87	5.9	8.0	4.2	39.3
	1700	.4312	8.37	3.47	28.69	1.69	18.17	14.88	6.0	7.8	5.9	54.2
	1900	.4746	9.32	4.02	23.34	1.67	17.55	13.04	4.8	6.3	5.9	51.8
3	100	.3948	.08	.00	1.96	.16	.90	.41	3.7	6.2	.3	2.3
	300	.4014	.08	.08	3.48	.25	1.49	.83	5.1	8.4	.5	4.0
	500	.4039	.25	.08	6.26	.33	2.67	1.75	5.7	9.0	.9	7.4
	700	.4018	.83	.33	10.38	.58	4.57	3.57	5.9	8.9	1.5	13.2
	900	.3966	1.72	.74	14.67	.82	6.88	5.90	6.0	8.5	2.3	20.3
	1100	.3943	2.85	1.22	18.33	.98	9.21	8.31	5.9	8.2	3.0	27.5
	1300	.3991	4.37	1.81	21.93	1.15	11.79	10.72	5.9	8.0	3.8	35.5
	1500	.4106	6.87	2.88	26.98	1.53	16.03	13.83	6.0	8.0	5.2	48.0
	1700	.4314	10.96	4.63	32.62	1.96	22.10	17.56	6.1	7.8	7.1	65.8
	1900	.4747	11.28	5.00	25.99	1.77	20.40	15.01	4.9	6.4	6.7	60.3

PREDICTED ION CONCENTRATIONS, ESP, SAR, EC, AND DISSOLVED CATIONS OF THE SOIL PROFILE FOR TREATMENT NO. 78 (WATER TABLE DEPTH 2000 MM; WATER TABLE EC 2 DS/M; CLAY LOAM SOIL; WHEAT CROP; 14 DAYS IRRIGATION INTERVAL WITH IRRIGATION APPLICATION AMOUNT AS 0.50 OF ET)

End of Year	Depth (mm)	Theta (cm3/cm3)	Ca	Mg	Na	K	Cl	SO4	ESP	SAR	EC (ds/m)	Diss. Cat. (meq/l)
			--------	--------	mmol/l	--------	--------	--------				
1	100	.3873	.32	.16	5.68	.32	2.40	1.92	4.9	7.6	.8	7.0
	300	.3907	1.21	.48	11.70	.65	5.25	4.84	5.5	8.0	1.7	15.8
	500	.3880	2.40	.96	16.19	.88	7.86	7.62	5.7	7.9	2.6	24.4
	700	.3820	2.68	1.10	16.73	.95	8.29	8.21	5.6	7.7	2.8	25.7
	900	.3805	2.44	1.02	15.72	.86	7.63	7.63	5.5	7.5	2.6	23.6
	1100	.3858	2.23	.96	15.38	.88	7.41	7.41	5.5	7.7	2.5	22.6
	1300	.3953	2.61	1.06	16.42	.90	8.17	8.00	5.6	7.7	2.7	24.8
	1500	.4092	4.40	1.86	21.31	1.18	11.67	10.65	5.8	7.9	3.8	34.9
	1700	.4310	8.37	3.56	29.48	1.69	18.70	14.60	6.1	8.1	6.0	55.0
	1900	.4745	7.65	3.33	19.41	1.57	14.71	10.00	4.3	5.8	5.0	43.0
2	100	.3878	.32	.16	5.21	.32	2.24	1.60	4.5	7.1	.8	6.4
	300	.3915	1.13	.49	11.16	.65	5.10	4.29	5.4	8.0	1.7	15.0
	500	.3891	2.41	1.05	16.80	.88	8.20	7.56	5.8	8.0	2.7	24.6
	700	.3833	3.25	1.35	18.85	1.03	9.58	9.27	5.8	7.8	3.1	29.2
	900	.3815	3.23	1.34	18.37	1.02	9.38	9.22	5.6	7.6	3.1	28.7
	1100	.3864	3.43	1.44	18.76	1.04	9.74	9.34	5.6	7.6	3.2	29.6
	1300	.3957	5.07	2.13	22.56	1.23	12.75	11.28	5.7	7.6	4.1	38.2
	1500	.4094	9.22	3.81	30.37	1.69	19.62	15.39	5.9	7.8	6.3	58.2
	1700	.4310	13.89	5.88	35.26	2.23	26.18	18.43	5.8	7.5	8.3	77.1
	1900	.4745	9.71	4.31	19.80	1.67	16.86	11.08	3.9	5.2	5.6	49.6
3	100	.3881	.32	.16	5.05	.32	2.25	1.52	4.2	6.7	.7	6.3
	300	.3920	1.13	.49	11.10	.65	5.10	4.13	5.3	7.9	1.7	15.0
	500	.3899	2.58	1.05	17.40	.97	8.62	7.65	5.9	8.2	2.8	25.6
	700	.3843	3.73	1.59	20.72	1.11	10.80	10.00	6.0	8.0	3.5	32.5
	900	.3823	4.42	1.82	21.64	1.18	11.61	10.90	5.8	7.7	3.8	35.2
	1100	.3869	5.52	2.32	23.58	1.28	13.51	11.99	5.7	7.6	4.4	40.4
	1300	.3960	8.51	3.60	29.05	1.64	18.49	14.89	5.8	7.5	5.9	54.8
	1500	.4095	13.37	5.67	36.38	2.03	26.48	19.38	5.9	7.7	8.2	76.5
	1700	.4311	15.05	6.86	37.50	2.40	31.17	20.84	5.9	7.6	8.9	83.6
	1900	.4746	10.59	4.80	20.20	1.67	18.34	11.86	3.9	5.1	5.9	52.6

PREDICTED ION CONCENTRATIONS, ESP, SAR, EC, AND DISSOLVED CATIONS OF THE SOIL PROFILE FOR TREATMENT NO. 79 (WATER TABLE DEPTH 2000 MM; WATER TABLE EC 2 DS/M; CLAY LOAM SOIL; WHEAT CROP; 04 DAYS IRRIGATION INTERVAL WITH IRRIGATION APPLICATION AMOUNT AS 0.75 OF ET)

End of Year	Depth (mm)	Theta (cm3/cm3)	Ca	Mg	Na	K	Cl	SO4	ESP	SAR	EC (ds/m)	Diss. Cat. (meq/l)
			mmol/l									
1	100	.3736	.39	.15	5.79	.39	2.55	1.78	4.6	7.1	.8	7.2
	300	.3747	1.86	.77	14.40	.77	6.89	6.12	5.5	7.8	2.2	20.5
	500	.3729	3.08	1.31	18.03	1.00	9.17	8.86	5.5	7.6	3.1	28.4
	700	.3738	2.55	1.08	15.99	.85	7.88	7.80	5.4	7.4	2.6	24.3
	900	.3784	2.11	.86	14.62	.78	6.96	6.96	5.4	7.5	2.3	21.4
	1100	.3857	2.07	.88	14.66	.80	6.93	6.93	5.5	7.7	2.3	21.4
	1300	.3956	2.37	.98	15.53	.90	7.52	7.52	5.6	7.7	2.5	23.0
	1500	.4093	3.04	1.27	17.93	1.01	9.22	8.79	5.8	7.9	3.0	27.7
	1700	.4310	4.63	1.96	22.08	1.25	12.47	10.60	6.0	8.1	4.0	36.6
	1900	.4745	5.10	2.16	17.55	1.37	11.47	8.33	4.7	6.5	3.9	33.4
2	100	.3770	.47	.16	5.76	.39	2.65	1.71	4.1	6.4	.9	7.4
	300	.3791	2.11	.86	15.51	.86	7.68	6.27	5.6	8.0	2.5	22.3
	500	.3777	3.82	1.64	21.07	1.09	11.00	10.07	5.9	8.0	3.5	33.1
	700	.3776	3.43	1.40	18.88	1.01	9.75	9.44	5.6	7.6	3.2	29.6
	900	.3809	2.68	1.10	16.61	.94	8.26	8.18	5.5	7.6	2.7	25.2
	1100	.3872	2.72	1.12	16.64	.96	8.32	8.08	5.5	7.6	2.7	25.3
	1300	.3964	3.44	1.47	18.84	1.06	9.91	9.17	5.7	7.7	3.2	29.6
	1500	.4097	4.99	2.12	22.69	1.27	12.87	10.84	5.8	7.8	4.2	38.3
	1700	.4311	7.30	3.03	25.47	1.60	16.30	12.20	5.6	7.5	5.3	47.8
	1900	.4746	6.86	2.94	17.65	1.47	13.24	9.02	4.1	5.6	4.5	38.7
3	100	.3797	.47	.24	5.65	.39	2.67	1.73	3.8	5.9	.9	7.5
	300	.3826	2.29	.95	16.21	.87	8.22	6.32	5.6	8.0	2.6	23.7
	500	.3815	4.49	1.89	23.49	1.18	12.61	10.96	6.1	8.3	4.0	37.4
	700	.3806	4.33	1.81	21.70	1.18	11.64	10.85	5.8	7.8	3.7	35.1
	900	.3828	3.56	1.50	19.14	1.03	10.04	9.57	5.6	7.6	3.3	30.3
	1100	.3883	3.77	1.52	19.50	1.04	10.35	9.55	5.6	7.6	3.4	31.1
	1300	.3970	5.00	2.05	22.39	1.23	12.71	10.83	5.7	7.6	4.1	37.8
	1500	.4099	7.11	2.96	26.17	1.52	16.18	12.53	5.7	7.6	5.3	47.9
	1700	.4312	9.53	4.01	27.17	1.87	19.07	13.54	5.3	6.9	6.3	56.2
	1900	.4746	8.04	3.53	17.94	1.57	14.51	9.61	3.9	5.2	4.9	42.6

PREDICTED ION CONCENTRATIONS, ESP, SAR, EC, AND DISSOLVED CATIONS OF THE SOIL PROFILE FOR TREATMENT NO. 80 (WATER TABLE DEPTH 2000 MM; WATER TABLE EC 2 DS/M; CLAY LOAM SOIL; WHEAT CROP; 04 DAYS IRRIGATION INTERVAL WITH IRRIGATION APPLICATION AMOUNT AS 0.50 OF ET)

End of Year	Depth (mm)	Theta (cm3/cm3)	Ca	Mg	Na	K	Cl	SO4	ESP	SAR	EC (ds/m)	Diss. Cat. (meq/l)
			mmol/l									
1	100	.3754	.85	.39	9.00	.54	4.03	3.34	4.9	7.2	1.3	11.9
	300	.3760	2.41	1.01	15.85	.85	7.77	7.38	5.5	7.6	2.6	23.8
	500	.3726	2.46	1.00	15.70	.85	7.70	7.62	5.4	7.4	2.6	24.2
	700	.3726	2.00	.85	14.24	.77	6.77	6.77	5.3	7.4	2.3	20.9
	900	.3772	1.95	.78	14.03	.78	6.62	6.62	5.4	7.5	2.2	20.3
	1100	.3847	2.07	.87	14.55	.79	6.92	6.92	5.5	7.6	2.3	21.2
	1300	.3950	2.61	1.06	16.32	.90	8.08	8.00	5.5	7.7	2.7	24.6
	1500	.4091	4.48	1.86	21.47	1.18	11.83	10.73	5.8	7.9	3.8	35.3
	1700	.4310	8.10	3.38	28.85	1.69	18.26	14.16	6.1	8.0	5.9	53.6
	1900	.4745	7.06	3.04	18.43	1.57	13.73	9.31	4.2	5.7	4.7	40.3
2	100	.3762	1.17	.47	10.10	.62	4.82	3.81	4.7	6.8	1.6	14.1
	300	.3770	3.19	1.32	18.62	1.01	9.58	8.57	5.7	7.8	3.1	28.6
	500	.3736	3.16	1.31	18.06	1.00	9.19	8.88	5.6	7.5	3.0	28.1
	700	.3732	2.47	1.00	15.65	.85	7.63	7.56	5.4	7.4	2.6	23.6
	900	.3776	2.42	1.01	15.53	.86	7.57	7.49	5.4	7.5	2.5	23.2
	1100	.3851	3.10	1.27	17.66	.95	9.07	8.59	5.5	7.5	3.0	27.5
	1300	.3953	5.23	2.21	22.71	1.31	12.99	11.19	5.6	7.5	4.2	38.8
	1500	.4092	9.22	3.89	30.35	1.69	19.70	15.13	5.9	7.7	6.3	58.3
	1700	.4310	13.09	5.52	33.39	2.14	24.84	17.19	5.6	7.3	7.9	72.9
	1900	.4745	8.73	3.82	17.94	1.57	15.20	9.90	3.7	5.0	5.1	44.6
3	100	.3765	1.48	.62	11.05	.70	5.52	4.28	4.6	6.7	1.8	15.9
	300	.3774	3.98	1.64	21.13	1.09	11.31	9.82	5.8	7.9	3.6	33.5
	500	.3740	4.02	1.70	20.63	1.08	10.97	10.20	5.6	7.7	3.5	33.0
	700	.3735	3.16	1.31	17.83	1.00	9.18	8.80	5.4	7.4	3.0	27.9
	900	.3778	3.51	1.48	18.58	1.01	9.76	9.05	5.4	7.3	3.2	29.5
	1100	.3852	5.25	2.23	22.52	1.27	12.97	11.06	5.5	7.3	4.2	38.8
	1300	.3953	8.82	3.68	29.24	1.63	18.87	14.62	5.7	7.4	6.1	55.9
	1500	.4092	13.61	5.75	35.76	2.11	25.96	18.43	5.8	7.4	8.2	76.5
	1700	.4310	16.30	7.03	35.00	2.40	28.58	18.79	5.3	6.9	9.0	84.0
	1900	.4745	9.41	4.22	17.84	1.57	15.98	10.20	3.6	4.8	5.3	46.8

PREDICTED ION CONCENTRATIONS, ESP, SAR, EC, AND DISSOLVED CATIONS OF THE SOIL PROFILE FOR TREATMENT NO. 81 (WATER TABLE DEPTH 2000 MM; WATER TABLE EC 6 DS/M; SANDY LOAM SOIL; COTTON CROP; 14 DAYS IRRIGATION INTERVAL WITH IRRIGATION APPLICATION AMOUNT AS 0.75 OF ET)

End of Year	Depth (mm)	Theta (cm3/cm3)	Ca	Mg	Na	K	Cl	SO4	ESP	SAR	EC (ds/m)	Diss. Cat. (meq/l)
			mmol/l									
1	100	.3106	.13	.06	3.21	.19	1.35	.90	3.9	6.2	.4	3.8
	300	.3174	.66	.26	7.94	.46	3.48	2.95	4.5	6.6	1.1	10.2
	500	.3244	1.88	.80	13.40	.74	6.50	6.03	4.8	6.6	2.1	19.6
	700	.3295	2.72	1.16	15.79	.89	8.03	7.76	4.9	6.6	2.7	24.7
	900	.3310	2.53	1.03	14.98	.82	7.52	7.45	4.8	6.6	2.5	23.2
	1100	.3337	2.07	.90	13.65	.76	6.62	6.62	4.8	6.6	2.2	20.3
	1300	.3412	1.90	.78	13.32	.78	6.42	6.42	4.9	6.8	2.1	19.7
	1500	.3553	2.64	1.10	15.49	.88	7.63	8.15	5.1	6.9	2.6	24.4
	1700	.3808	8.65	3.62	28.25	1.49	17.23	20.69	5.7	7.2	6.3	60.1
	1900	.4447	11.67	6.80	43.00	1.84	29.40	32.07	7.8	9.6	9.9	96.7
2	100	.3147	.07	.00	1.95	.13	.85	.39	3.3	5.5	.3	2.2
	300	.3221	.13	.07	3.59	.20	1.53	.87	4.3	7.1	.5	4.1
	500	.3282	.47	.20	7.32	.41	3.19	2.31	4.7	7.3	1.0	9.1
	700	.3328	1.44	.62	12.51	.69	5.91	4.95	5.0	7.2	1.9	17.3
	900	.3367	2.71	1.11	16.49	.90	8.42	7.65	5.1	7.0	2.7	25.1
	1100	.3409	3.31	1.41	17.61	.92	9.23	8.80	5.1	6.8	3.0	27.9
	1300	.3470	3.44	1.43	17.64	1.00	9.32	9.32	5.0	6.7	3.1	28.7
	1500	.3581	5.11	2.15	21.53	1.18	12.73	13.02	5.3	6.9	4.3	39.8
	1700	.3813	10.01	4.96	38.68	1.65	26.23	26.86	7.2	8.9	8.5	82.5
	1900	.4450	11.22	9.01	54.80	1.84	38.34	37.88	9.6	11.7	11.8	117.4
3	100	.3224	.13	.07	2.40	.20	1.07	.53	2.9	4.9	.4	2.9
	300	.3266	.20	.07	4.25	.27	1.89	.94	4.3	6.9	.6	5.0
	500	.3255	.54	.20	7.53	.40	3.36	2.15	4.7	7.3	1.1	9.4
	700	.3216	1.33	.60	11.96	.60	5.65	4.45	4.9	7.0	1.8	16.4
	900	.3209	2.52	1.06	15.78	.80	8.02	7.09	5.0	6.8	2.6	23.7
	1100	.3266	3.44	1.42	17.81	.94	9.51	9.04	4.9	6.6	3.1	28.6
	1300	.3376	4.88	2.02	20.58	1.12	12.14	11.93	5.0	6.6	4.0	37.2
	1500	.3540	8.92	3.80	30.87	1.46	22.89	20.99	5.9	7.4	7.0	66.8
	1700	.3806	9.52	7.31	59.45	1.89	47.89	35.23	10.1	12.8	12.2	121.3
	1900	.4446	10.75	11.57	64.03	1.75	43.54	44.09	10.7	13.0	13.4	135.3

PREDICTED ION CONCENTRATIONS, ESP, SAR, EC, AND DISSOLVED CATIONS OF THE SOIL PROFILE FOR TREATMENT NO. 82 (WATER TABLE DEPTH 2000 MM; WATER TABLE EC 6 DS/M; SANDY LOAM SOIL; COTTON CROP; 14 DAYS IRRIGATION INTERVAL WITH IRRIGATION APPLICATION AMOUNT AS 0.50 OF ET)

End of Year	Depth (mm)	Theta (cm3/cm3)	Ca	Mg	Na	K	Cl	SO4	ESP	SAR	EC (ds/m)	Diss. Cat. (meq/l)
			mmol/l									
1	100	.2844	.65	.29	7.05	.41	3.23	2.70	3.8	5.5	1.1	9.4
	300	.2943	1.88	.79	12.53	.67	6.14	5.78	4.3	5.9	2.0	18.7
	500	.3010	2.36	1.00	13.99	.75	7.09	6.90	4.4	6.0	2.4	22.1
	700	.3074	1.91	.83	12.58	.70	6.10	6.10	4.4	6.1	2.1	19.1
	900	.3148	1.63	.72	11.90	.65	5.66	5.66	4.5	6.2	1.9	17.3
	1100	.3239	1.67	.67	12.05	.67	5.69	5.69	4.6	6.4	1.9	17.4
	1300	.3359	1.87	.76	13.05	.76	6.25	6.32	4.8	6.7	2.1	19.4
	1500	.3528	3.79	1.53	18.08	1.02	10.42	11.08	5.1	6.7	3.6	33.5
	1700	.3802	9.66	4.87	39.67	1.65	31.81	30.48	7.5	9.2	9.8	95.6
	1900	.4443	11.20	9.00	54.99	1.84	39.38	38.55	9.6	11.8	12.0	119.6
2	100	.3071	.25	.13	4.19	.25	1.84	1.21	3.6	5.6	.6	5.2
	300	.3131	1.04	.45	9.83	.52	4.59	3.69	4.5	6.5	1.5	13.3
	500	.3179	2.56	1.05	15.24	.79	7.82	7.03	4.9	6.5	2.5	23.3
	700	.3214	2.92	1.20	16.07	.86	8.37	7.97	4.8	6.4	2.7	25.4
	900	.3252	2.42	1.01	14.38	.81	7.19	7.12	4.7	6.4	2.4	22.2
	1100	.3309	2.26	.96	14.08	.82	7.11	7.11	4.7	6.5	2.4	21.9
	1300	.3402	3.87	1.62	17.92	.98	11.04	10.82	4.9	6.5	3.6	33.5
	1500	.3551	9.10	3.96	32.06	1.47	27.29	23.26	6.2	7.6	7.9	75.8
	1700	.3808	9.13	8.50	68.84	1.97	59.09	41.07	11.5	14.6	14.4	144.3
	1900	.4447	10.38	13.78	74.24	1.84	53.57	50.17	12.0	14.5	15.5	157.7
3	100	.3144	.45	.19	5.46	.39	2.60	1.69	3.4	5.3	.9	7.3
	300	.3166	1.24	.52	10.53	.59	5.04	3.86	4.4	6.5	1.6	14.6
	500	.3139	2.46	1.04	15.37	.78	7.78	6.81	4.8	6.6	2.5	23.2
	700	.3124	2.97	1.23	16.07	.84	8.39	7.87	4.7	6.3	2.7	25.3
	900	.3165	2.75	1.11	15.11	.85	7.91	7.72	4.6	6.2	2.6	24.2
	1100	.3250	3.09	1.28	15.85	.87	9.80	9.27	4.7	6.2	3.2	29.3
	1300	.3371	3.20	1.39	17.76	.84	20.20	16.72	5.6	6.9	6.3	57.1
	1500	.3538	.88	.95	27.56	.66	49.49	34.80	13.8	17.7	13.7	128.3
	1700	.3806	7.94	14.86	101.99	2.28	87.44	60.86	15.2	19.0	20.5	212.9
	1900	.4446	10.01	16.99	83.13	1.75	57.32	56.59	13.0	15.3	16.8	174.5

PREDICTED ION CONCENTRATIONS, ESP, SAR, EC, AND DISSOLVED CATIONS OF THE SOIL PROFILE FOR TREATMENT NO. 83 (WATER TABLE DEPTH 2000 MM; WATER TABLE EC 6 DS/M; SANDY LOAM SOIL; COTTON CROP; 04 DAYS IRRIGATION INTERVAL WITH IRRIGATION APPLICATION AMOUNT AS 0.75 OF ET)

End of Year	Depth (mm)	Theta (cm3/cm3)	Ca	Mg	Na	K	Cl	SO4	ESP	SAR	EC (ds/m)	Diss. Cat. (meq/l)
			mmol/l									
1	100	.3185	.66	.26	7.24	.46	3.36	2.50	4.1	6.1	1.1	9.6
	300	.3140	2.47	1.04	14.86	.78	7.59	6.81	4.7	6.4	2.4	22.6
	500	.3081	2.42	1.02	14.20	.76	7.19	7.00	4.5	6.1	2.4	22.3
	700	.3106	1.80	.77	12.13	.71	5.84	5.84	4.4	6.2	2.0	18.2
	900	.3167	1.57	.65	11.71	.65	5.50	5.50	4.5	6.3	1.9	16.9
	1100	.3253	1.61	.67	11.96	.67	5.65	5.65	4.6	6.5	1.9	17.2
	1300	.3371	1.81	.77	12.75	.70	6.06	6.13	4.8	6.7	2.0	18.6
	1500	.3538	3.00	1.24	16.23	.88	8.11	8.85	5.0	6.8	2.8	26.4
	1700	.3806	9.59	4.01	29.57	1.57	18.24	22.49	5.8	7.2	6.7	65.0
	1900	.4446	11.57	6.52	40.88	1.75	27.56	31.88	7.5	9.2	9.7	94.3
2	100	.3259	.47	.20	5.52	.40	2.63	1.62	3.6	5.6	.9	7.2
	300	.3177	2.17	.92	14.51	.79	7.42	5.78	4.8	6.8	2.4	21.4
	500	.3139	3.37	1.43	17.45	.91	9.34	8.30	4.8	6.4	3.0	27.9
	700	.3176	2.62	1.12	14.96	.85	7.68	7.35	4.6	6.2	2.5	23.4
	900	.3233	2.07	.87	13.29	.73	6.48	6.41	4.6	6.3	2.2	20.0
	1100	.3304	2.05	.89	13.45	.75	6.55	6.62	4.7	6.5	2.2	20.3
	1300	.3402	3.23	1.34	16.45	.91	8.72	9.21	4.8	6.5	3.0	27.8
	1500	.3551	7.04	2.93	24.87	1.32	16.58	17.17	5.4	6.7	5.5	52.4
	1700	.3808	9.91	5.51	43.27	1.73	32.97	29.50	7.9	9.8	9.7	94.6
	1900	.4447	11.12	8.91	52.83	1.75	37.49	38.13	9.3	11.3	11.8	117.2
3	100	.3205	.86	.40	6.82	.53	3.51	2.12	3.3	5.0	1.2	9.7
	300	.2987	2.28	.93	14.38	.80	7.53	5.55	4.5	6.4	2.4	21.6
	500	.3008	3.29	1.37	17.40	.93	9.38	7.96	4.7	6.3	3.0	27.7
	700	.3074	2.99	1.21	15.69	.83	8.32	7.68	4.5	6.1	2.7	25.0
	900	.3151	2.41	1.04	14.19	.78	7.16	7.03	4.5	6.2	2.4	22.0
	1100	.3246	2.75	1.14	15.09	.87	7.91	8.05	4.6	6.2	2.7	24.6
	1300	.3367	5.01	2.09	20.17	1.11	13.08	13.01	4.9	6.3	4.3	40.2
	1500	.3537	8.11	3.73	32.67	1.46	28.35	24.92	6.6	8.1	8.5	80.9
	1700	.3805	9.28	8.02	63.44	1.97	52.75	38.60	10.8	13.5	13.3	133.1
	1900	.4446	10.66	11.57	63.02	1.75	43.73	44.74	10.7	12.8	13.5	136.8

PREDICTED ION CONCENTRATIONS, ESP, SAR, EC, AND DISSOLVED CATIONS OF THE SOIL PROFILE
FOR TREATMENT NO. 84 (WATER TABLE DEPTH 2000 MM; WATER TABLE EC 6 DS/M; SANDY LOAM SOIL;
COTTON CROP; 04 DAYS IRRIGATION INTERVAL WITH IRRIGATION APPLICATION AMOUNT AS 0.50 OF ET)

End of Year	Depth (mm)	Theta (cm3/cm3)	Ca	Mg	Na	K	Cl	SO4	ESP	SAR	EC (ds/m)	Diss. Cat. (meq/l)
			mmol/l									
1	100	.3089	1.34	.57	10.47	.64	5.04	4.28	4.2	6.0	1.6	14.9
	300	.3053	2.40	1.01	14.13	.76	7.19	6.81	4.5	6.1	2.4	22.1
	500	.3044	1.76	.75	12.08	.69	5.85	5.79	4.3	6.0	2.0	18.4
	700	.3085	1.53	.64	11.28	.64	5.29	5.29	4.4	6.1	1.8	16.4
	900	.3153	1.50	.65	11.34	.65	5.34	5.34	4.5	6.3	1.8	16.4
	1100	.3244	1.61	.67	11.80	.67	5.56	5.56	4.6	6.4	1.9	17.0
	1300	.3365	1.88	.76	13.07	.76	6.26	6.33	4.8	6.6	2.1	19.3
	1500	.3536	4.09	1.68	18.92	1.02	10.74	10.74	5.1	6.7	3.5	32.9
	1700	.3805	10.85	5.35	41.19	1.81	31.92	24.61	7.2	9.1	8.6	83.6
	1900	.4446	11.11	9.00	54.66	1.84	38.95	38.49	9.6	11.7	12.0	119.3
2	100	.2987	1.23	.56	9.44	.56	4.69	3.52	3.8	5.6	1.5	13.6
	300	.3040	3.01	1.26	16.14	.88	8.60	7.47	4.6	6.2	2.8	25.6
	500	.3097	2.62	1.09	14.65	.83	7.55	7.17	4.5	6.1	2.5	22.9
	700	.3153	1.89	.78	12.57	.72	6.06	5.99	4.5	6.2	2.0	18.8
	900	.3211	1.79	.73	12.34	.66	5.90	5.90	4.6	6.4	2.0	18.2
	1100	.3286	2.31	.95	13.99	.81	7.20	7.06	4.7	6.4	2.4	21.8
	1300	.3391	4.69	1.96	19.69	1.12	13.03	11.49	4.9	6.4	4.0	36.9
	1500	.3546	7.77	3.66	33.92	1.47	31.58	21.03	6.8	8.6	8.1	76.2
	1700	.3807	9.28	9.20	72.84	2.05	61.98	40.27	11.8	15.0	14.5	145.6
	1900	.4447	10.47	13.78	72.59	1.84	51.54	48.97	11.8	14.1	15.0	153.3
3	100	.3083	1.91	.83	11.47	.70	6.18	4.52	3.9	5.5	2.0	17.6
	300	.2963	3.18	1.35	16.59	.86	9.00	7.53	4.5	6.1	2.9	26.4
	500	.3007	2.73	1.18	14.97	.81	7.89	7.27	4.4	6.0	2.5	23.6
	700	.3073	2.10	.89	13.02	.70	6.48	6.35	4.4	6.0	2.2	19.9
	900	.3151	2.15	.91	13.22	.72	6.84	6.58	4.5	6.1	2.2	20.6
	1100	.3246	3.42	1.41	16.57	.94	10.53	9.12	4.6	6.2	3.2	29.6
	1300	.3367	7.17	2.99	26.09	1.32	23.37	16.70	5.4	6.8	6.2	58.4
	1500	.3537	9.28	5.85	53.35	1.68	54.37	30.99	9.3	11.7	12.2	119.0
	1700	.3805	8.10	16.04	107.15	2.44	89.23	60.22	15.4	19.3	20.5	213.4
	1900	.4446	10.01	17.09	82.49	1.75	56.68	56.03	12.8	15.2	16.7	172.8

PREDICTED ION CONCENTRATIONS, ESP, SAR, EC, AND DISSOLVED CATIONS OF THE SOIL PROFILE FOR TREATMENT NO. 85 (WATER TABLE DEPTH 2000 MM; WATER TABLE EC 6 DS/M; SANDY LOAM SOIL; WHEAT CROP; 14 DAYS IRRIGATION INTERVAL WITH IRRIGATION APPLICATION AMOUNT AS 0.75 OF ET)

End of Year	Depth (mm)	Theta (cm3/cm3)	Ca	Mg	Na	K	Cl	SO4	ESP	SAR	EC (ds/m)	Diss. Cat. (meq/l)
			mmol/l									
1	100	.3530	.07	.00	2.84	.22	1.17	.73	4.2	7.1	.4	3.3
	300	.3593	.45	.22	7.28	.45	3.12	2.52	5.0	7.6	1.0	9.1
	500	.3507	1.81	.72	13.55	.72	6.45	5.94	5.2	7.3	2.1	19.4
	700	.3333	2.82	1.17	16.25	.90	8.26	8.06	5.0	6.7	2.8	25.6
	900	.3295	2.66	1.09	15.32	.82	7.69	7.62	4.8	6.5	2.6	23.8
	1100	.3354	2.15	.90	13.93	.76	6.79	6.79	4.8	6.7	2.3	20.9
	1300	.3441	1.99	.85	13.51	.78	6.47	6.47	4.9	6.8	2.2	19.9
	1500	.3570	2.73	1.11	15.78	.89	7.82	8.33	5.1	6.9	2.7	24.9
	1700	.3811	9.45	3.94	29.84	1.57	18.66	22.13	5.8	7.2	6.7	64.6
	1900	.4449	11.58	7.17	45.23	1.84	31.53	33.28	8.2	10.0	10.3	101.2
2	100	.3540	.07	.00	2.41	.15	1.02	.51	3.7	6.3	.3	2.8
	300	.3618	.22	.07	5.31	.30	2.32	1.50	4.9	7.8	.8	6.4
	500	.3563	1.03	.44	10.82	.59	4.93	3.90	5.3	7.7	1.7	14.4
	700	.3410	2.40	.99	15.78	.85	7.82	7.05	5.2	7.2	2.6	23.4
	900	.3352	3.12	1.32	17.18	.90	8.86	8.52	5.1	6.8	2.9	27.0
	1100	.3391	2.94	1.26	16.39	.91	8.41	8.34	5.0	6.7	2.8	25.9
	1300	.3463	3.15	1.29	16.81	.93	8.80	9.02	5.0	6.7	3.0	27.5
	1500	.3580	6.21	2.59	23.60	1.26	15.16	15.31	5.4	6.9	5.0	47.0
	1700	.3813	10.08	5.91	47.58	1.81	37.74	29.31	8.4	10.6	10.2	99.0
	1900	.4450	10.94	10.48	61.23	1.84	43.76	41.47	10.4	12.7	13.0	130.2
3	100	.3545	.07	.00	2.12	.15	.95	.44	3.3	5.6	.3	2.5
	300	.3631	.15	.08	4.50	.30	1.95	1.05	4.7	7.7	.6	5.3
	500	.3596	.67	.30	8.92	.52	4.01	2.75	5.3	8.0	1.3	11.2
	700	.3459	1.72	.71	14.01	.71	6.72	5.50	5.4	7.6	2.2	19.7
	900	.3388	2.87	1.19	17.08	.91	8.75	7.91	5.2	7.1	2.8	26.1
	1100	.3414	3.60	1.48	18.20	.99	9.80	9.38	5.1	6.8	3.2	29.6
	1300	.3478	4.81	2.01	20.62	1.15	12.29	12.00	5.1	6.7	4.0	37.5
	1500	.3587	8.82	3.85	31.50	1.48	23.57	20.90	6.1	7.6	7.0	67.2
	1700	.3814	9.61	8.12	64.07	1.97	51.62	35.85	10.7	13.6	12.7	126.3
	1900	.4451	10.58	13.24	72.10	1.84	51.41	47.18	11.7	14.2	14.7	149.5

PREDICTED ION CONCENTRATIONS, ESP, SAR, EC, AND DISSOLVED CATIONS OF THE SOIL PROFILE FOR TREATMENT NO. 86 (WATER TABLE DEPTH 2000 MM; WATER TABLE EC 6 DS/M; SANDY LOAM SOIL; WHEAT CROP; 14 DAYS IRRIGATION INTERVAL WITH IRRIGATION APPLICATION AMOUNT AS 0.50 OF ET)

End of Year	Depth (mm)	Theta (cm3/cm3)	Ca	Mg	Na	K	Cl	SO4	ESP	SAR	EC (ds/m)	Diss. Cat. (meq/l)
			mmol/l									
1	100	.3415	.28	.14	5.36	.35	2.26	1.76	4.3	6.7	.8	6.6
	300	.3379	1.47	.63	11.94	.63	5.59	5.10	4.9	6.9	1.8	16.8
	500	.3198	2.51	1.06	15.00	.79	7.53	7.33	4.8	6.4	2.5	23.6
	700	.3130	2.20	.91	13.65	.78	6.73	6.73	4.5	6.2	2.3	21.1
	900	.3176	1.84	.79	12.47	.72	5.97	5.97	4.5	6.3	2.0	18.4
	1100	.3257	1.75	.74	12.31	.67	5.85	5.85	4.6	6.5	2.0	17.9
	1300	.3372	1.88	.77	13.10	.77	6.27	6.34	4.8	6.7	2.1	19.4
	1500	.3538	3.73	1.54	17.98	1.02	10.16	10.82	5.1	6.7	3.5	32.7
	1700	.3805	9.75	4.87	39.39	1.65	31.45	29.72	7.5	9.1	9.6	93.6
	1900	.4446	11.11	9.28	56.86	1.84	41.34	39.04	9.8	12.0	12.3	122.8
2	100	.3428	.35	.14	5.17	.35	2.27	1.63	4.0	6.3	.8	6.4
	300	.3402	1.41	.63	11.88	.63	5.62	4.71	4.9	7.0	1.8	16.6
	500	.3230	2.74	1.13	16.15	.87	8.28	7.61	4.9	6.7	2.7	24.8
	700	.3154	2.67	1.11	15.25	.85	7.82	7.62	4.6	6.3	2.6	24.0
	900	.3196	2.18	.92	13.67	.73	6.74	6.74	4.6	6.3	2.3	20.9
	1100	.3272	2.23	.95	13.72	.74	6.90	6.96	4.7	6.4	2.3	21.4
	1300	.3382	3.84	1.61	17.75	.98	10.83	10.69	4.8	6.4	3.6	33.1
	1500	.3542	9.37	4.03	32.13	1.54	27.52	23.34	6.1	7.5	8.0	76.2
	1700	.3806	9.12	8.96	73.21	2.04	65.03	41.60	12.0	15.3	15.1	151.5
	1900	.4446	10.29	14.42	76.15	1.84	53.65	50.80	12.2	14.7	15.5	158.8
3	100	.3436	.35	.14	5.04	.35	2.27	1.49	3.8	5.9	.8	6.4
	300	.3418	1.41	.64	11.93	.71	5.79	4.52	4.9	7.0	1.9	16.7
	500	.3254	2.89	1.21	16.88	.87	8.74	7.66	5.0	6.9	2.8	26.0
	700	.3175	3.08	1.31	16.60	.92	8.72	8.27	4.8	6.4	2.8	26.4
	900	.3211	2.79	1.13	15.26	.86	8.03	7.89	4.6	6.3	2.7	24.6
	1100	.3283	3.39	1.42	16.62	.95	10.04	9.43	4.7	6.2	3.2	29.8
	1300	.3388	6.58	2.73	24.15	1.26	20.30	16.31	5.3	6.6	5.8	54.2
	1500	.3545	9.38	5.35	47.97	1.61	48.27	29.37	8.6	10.7	11.3	109.6
	1700	.3807	8.18	15.50	105.79	2.36	89.75	58.76	15.3	19.3	20.3	211.0
	1900	.4446	9.92	18.19	87.63	1.75	60.63	58.79	13.4	15.9	17.5	182.4

PREDICTED ION CONCENTRATIONS, ESP, SAR, EC, AND DISSOLVED CATIONS OF THE SOIL PROFILE FOR TREATMENT NO. 87 (WATER TABLE DEPTH 2000 MM; WATER TABLE EC 6 DS/M; SANDY LOAM SOIL; WHEAT CROP; 04 DAYS IRRIGATION INTERVAL WITH IRRIGATION APPLICATION AMOUNT AS 0.75 OF ET)

End of Year	Depth (mm)	Theta (cm3/cm3)	Ca	Mg	Na	K	Cl	SO4	ESP	SAR	EC (ds/m)	Diss. Cat. (meq/l)
			mmol/l									
1	100	.3249	.47	.20	6.04	.40	2.75	1.88	4.0	6.2	.9	7.7
	300	.3186	2.11	.86	13.96	.72	6.98	6.19	4.7	6.6	2.3	20.7
	500	.3119	2.58	1.10	14.89	.84	7.54	7.35	4.6	6.2	2.5	23.6
	700	.3129	1.94	.84	12.87	.71	6.27	6.21	4.5	6.2	2.1	19.5
	900	.3181	1.71	.72	12.09	.66	5.72	5.72	4.5	6.3	1.9	17.7
	1100	.3261	1.68	.67	12.13	.67	5.73	5.73	4.6	6.5	1.9	17.5
	1300	.3375	1.74	.77	12.69	.70	6.00	6.07	4.8	6.7	2.0	18.5
	1500	.3540	2.63	1.10	15.36	.88	7.53	8.19	5.0	6.8	2.6	24.4
	1700	.3806	8.34	3.46	27.21	1.49	16.36	21.07	5.7	7.0	6.3	60.1
	1900	.4446	11.39	6.25	39.59	1.75	26.82	32.70	7.4	9.0	9.8	95.4
2	100	.3305	.55	.20	6.01	.41	2.87	1.84	3.7	5.7	.9	8.0
	300	.3268	2.36	1.01	15.26	.81	7.83	6.28	4.9	6.9	2.5	22.8
	500	.3187	3.23	1.38	17.25	.92	9.15	8.30	4.8	6.5	2.9	27.4
	700	.3172	2.49	1.05	14.48	.79	7.34	7.14	4.6	6.3	2.4	22.5
	900	.3208	1.92	.80	12.92	.73	6.23	6.23	4.6	6.4	2.1	19.3
	1100	.3279	1.96	.81	13.01	.75	6.30	6.44	4.7	6.4	2.1	19.6
	1300	.3385	2.94	1.19	15.67	.91	8.11	8.74	4.8	6.4	2.8	26.2
	1500	.3544	6.59	2.71	23.65	1.24	15.45	16.91	5.3	6.6	5.4	50.7
	1700	.3807	9.75	5.43	43.26	1.73	34.61	30.20	7.9	9.8	10.0	97.8
	1900	.4446	11.02	9.19	54.38	1.75	38.58	39.50	9.6	11.6	12.2	121.0
3	100	.3346	.55	.28	5.88	.41	2.90	1.73	3.5	5.3	.9	8.0
	300	.3328	2.48	1.03	15.95	.89	8.32	6.19	5.0	7.0	2.7	23.9
	500	.3241	3.75	1.54	19.15	1.00	10.38	8.91	5.0	6.8	3.3	30.7
	700	.3207	2.98	1.26	16.17	.86	8.48	7.95	4.7	6.4	2.7	25.5
	900	.3232	2.40	1.00	14.22	.80	7.15	7.15	4.6	6.3	2.4	22.0
	1100	.3294	2.72	1.09	14.97	.82	7.83	8.10	4.7	6.3	2.7	24.7
	1300	.3394	4.84	2.03	19.70	1.12	12.62	12.97	4.9	6.3	4.2	39.5
	1500	.3547	8.28	3.66	31.15	1.39	26.02	24.04	6.3	7.7	8.0	76.6
	1700	.3807	9.36	7.47	59.46	1.89	49.40	37.13	10.3	12.9	12.7	126.6
	1900	.4447	10.57	11.67	64.41	1.75	45.66	45.30	10.8	13.0	13.8	139.8

PREDICTED ION CONCENTRATIONS, ESP, SAR, EC, AND DISSOLVED CATIONS OF THE SOIL PROFILE FOR TREATMENT NO. 88 (WATER TABLE DEPTH 2000 MM; WATER TABLE EC 6 DS/M; SANDY LOAM SOIL; WHEAT CROP; 04 DAYS IRRIGATION INTERVAL WITH IRRIGATION APPLICATION AMOUNT AS 0.50 OF ET)

End of Year	Depth (mm)	Theta (cm3/cm3)	Ca	Mg	Na	K	Cl	SO4	ESP	SAR	EC (ds/m)	Diss. Cat. (meq/l)
			mmol/l									
1	100	.3240	.87	.40	8.64	.54	4.02	3.21	4.2	6.3	1.3	11.6
	300	.3137	2.27	.91	13.94	.78	7.00	6.61	4.6	6.3	2.3	21.4
	500	.3056	2.02	.82	12.88	.69	6.31	6.25	4.4	6.1	2.2	20.0
	700	.3084	1.66	.70	11.85	.64	5.67	5.67	4.4	6.1	1.9	17.5
	900	.3151	1.63	.65	11.72	.65	5.53	5.53	4.5	6.2	1.9	17.0
	1100	.3241	1.67	.67	12.05	.67	5.69	5.69	4.6	6.4	1.9	17.4
	1300	.3363	1.88	.76	12.99	.76	6.25	6.32	4.8	6.7	2.1	19.2
	1500	.3534	3.80	1.61	18.18	1.02	10.08	10.44	5.0	6.7	3.4	31.8
	1700	.3805	10.93	5.19	39.86	1.81	30.66	23.98	7.0	8.8	8.3	81.1
	1900	.4445	10.56	8.63	54.18	1.74	39.58	40.96	9.9	11.8	12.5	123.7
2	100	.3253	1.28	.54	9.75	.60	4.84	3.70	4.1	6.0	1.6	13.9
	300	.3154	2.93	1.24	16.16	.85	8.47	7.56	4.8	6.5	2.7	25.3
	500	.3065	2.41	1.01	14.19	.76	7.22	6.97	4.5	6.1	2.4	22.2
	700	.3089	1.85	.77	12.38	.70	6.00	6.00	4.4	6.1	2.0	18.6
	900	.3155	1.76	.72	12.19	.65	5.87	5.87	4.5	6.3	2.0	18.0
	1100	.3245	2.15	.87	13.48	.74	6.77	6.77	4.6	6.3	2.3	20.8
	1300	.3366	4.10	1.67	18.29	1.04	11.41	10.71	4.8	6.3	3.6	33.7
	1500	.3536	9.79	4.24	32.95	1.53	28.20	22.94	6.1	7.5	7.9	76.1
	1700	.3805	9.20	8.73	71.62	2.04	63.68	41.12	11.8	15.0	14.9	149.0
	1900	.4446	10.29	13.87	73.21	1.84	51.07	50.43	11.8	14.2	15.2	155.7
3	100	.3259	1.55	.67	10.57	.67	5.45	4.04	4.0	5.9	1.8	15.6
	300	.3162	3.59	1.50	18.16	.98	9.93	8.43	4.8	6.5	3.2	29.3
	500	.3071	2.92	1.21	15.67	.82	8.25	7.68	4.6	6.2	2.7	24.7
	700	.3093	2.17	.89	13.29	.77	6.65	6.52	4.5	6.1	2.2	20.4
	900	.3157	2.22	.91	13.50	.78	7.04	6.85	4.5	6.1	2.3	21.3
	1100	.3247	3.56	1.48	16.77	.94	10.73	9.66	4.6	6.1	3.4	30.8
	1300	.3368	7.31	3.06	25.54	1.32	22.41	17.33	5.3	6.6	6.3	58.6
	1500	.3537	9.28	5.41	49.18	1.61	50.13	30.11	8.8	11.0	11.7	112.9
	1700	.3805	8.10	15.02	103.14	2.36	86.87	58.80	15.1	19.0	20.0	208.2
	1900	.4446	9.92	17.36	83.41	1.75	57.23	57.23	13.0	15.3	16.9	175.7

PREDICTED ION CONCENTRATIONS, ESP, SAR, EC, AND DISSOLVED CATIONS OF THE SOIL PROFILE
FOR TREATMENT NO. 89 (WATER TABLE DEPTH 2000 MM; WATER TABLE EC 6 DS/M; CLAY LOAM SOIL;
COTTON CROP; 14 DAYS IRRIGATION INTERVAL WITH IRRIGATION APPLICATION AMOUNT AS 0.75 OF ET)

End of Year	Depth (mm)	Theta (cm3/cm3)	Ca	Mg	Na	K	Cl	SO4	ESP	SAR	EC (ds/m)	Diss. Cat. (meq/l)
			mmol/l									
1	100	.3634	.15	.08	3.53	.23	1.43	.98	4.5	7.4	.5	4.1
	300	.3684	.53	.23	7.84	.46	3.35	2.82	5.0	7.6	1.1	9.9
	500	.3739	1.55	.62	12.98	.70	6.03	5.64	5.4	7.6	2.0	18.2
	700	.3800	2.51	1.02	16.33	.86	8.01	7.69	5.6	7.7	2.6	24.5
	900	.3863	2.79	1.20	17.24	.96	8.54	8.46	5.7	7.7	2.8	26.3
	1100	.3925	2.68	1.14	16.87	.97	8.27	8.27	5.7	7.8	2.8	25.6
	1300	.4001	2.81	1.16	16.86	.99	8.35	8.60	5.6	7.8	2.8	26.1
	1500	.4114	4.34	1.78	20.40	1.19	10.80	12.84	5.8	7.6	4.0	37.4
	1700	.4316	8.74	4.01	32.64	1.61	20.78	27.73	7.0	8.6	8.3	79.4
	1900	.4748	11.97	6.97	41.30	1.77	27.17	35.51	7.8	9.4	10.4	101.5
2	100	.3649	.08	.00	2.04	.15	.90	.45	3.8	6.5	.3	2.3
	300	.3697	.08	.08	3.44	.23	1.45	.84	4.8	7.9	.5	4.0
	500	.3745	.31	.15	6.27	.39	2.63	1.93	5.3	8.3	.9	7.5
	700	.3792	.86	.39	10.42	.55	4.62	3.84	5.6	8.3	1.5	13.5
	900	.3842	1.83	.79	14.61	.79	6.83	6.19	5.7	8.2	2.2	20.5
	1100	.3902	2.82	1.21	17.82	.97	8.87	8.55	5.8	8.0	2.9	26.9
	1300	.3984	4.12	1.73	20.66	1.15	11.03	11.36	5.8	7.8	3.8	35.0
	1500	.4106	6.45	2.80	27.06	1.36	16.03	17.65	6.4	8.2	5.6	53.0
	1700	.4314	11.05	6.06	43.59	1.96	27.01	32.44	8.1	10.0	9.6	94.9
	1900	.4747	11.87	9.02	52.28	1.77	34.62	39.43	9.4	11.4	11.8	117.0
3	100	.3739	.08	.08	2.47	.23	1.08	.54	3.5	5.8	.4	2.9
	300	.3788	.16	.08	3.99	.23	1.72	.94	4.8	7.8	.6	4.6
	500	.3826	.32	.16	6.48	.40	2.77	1.82	5.4	8.5	.9	7.8
	700	.3857	.80	.32	10.28	.56	4.54	3.59	5.7	8.4	1.5	13.2
	900	.3890	1.85	.80	14.87	.80	7.07	6.27	5.9	8.3	2.3	20.9
	1100	.3934	3.50	1.46	19.83	1.06	10.40	10.16	5.9	8.0	3.4	31.8
	1300	.4002	6.61	2.81	26.87	1.41	16.45	17.03	6.2	7.9	5.5	52.3
	1500	.4114	3.83	2.30	32.13	1.19	29.92	30.00	9.8	12.2	10.1	94.8
	1700	.4316	10.43	8.92	64.12	2.14	46.01	41.29	11.1	13.8	13.2	132.1
	1900	.4748	11.67	10.79	57.19	1.67	37.57	42.18	9.9	11.9	12.5	125.6

PREDICTED ION CONCENTRATIONS, ESP, SAR, EC, AND DISSOLVED CATIONS OF THE SOIL PROFILE FOR TREATMENT NO. 90 (WATER TABLE DEPTH 2000 MM; WATER TABLE EC 6 DS/M; CLAY LOAM SOIL; COTTON CROP; 14 DAYS IRRIGATION INTERVAL WITH IRRIGATION APPLICATION AMOUNT AS 0.50 OF ET)

End of Year	Depth (mm)	Theta (cm3/cm3)	Ca	Mg	Na	K	Cl	SO4	ESP	SAR	EC (ds/m)	Diss. Cat. (meq/l)
			mmol/l									
1	100	.3500	.72	.29	8.39	.51	3.76	3.25	4.6	6.9	1.2	11.1
	300	.3565	1.92	.81	13.85	.74	6.63	6.26	5.2	7.1	2.2	20.3
	500	.3628	2.70	1.12	16.34	.90	8.17	8.02	5.3	7.3	2.7	25.4
	700	.3692	2.52	1.07	15.94	.92	7.86	7.78	5.3	7.3	2.6	24.3
	900	.3761	2.25	.93	15.15	.85	7.30	7.30	5.4	7.5	2.4	22.5
	1100	.3842	2.22	.95	15.24	.87	7.30	7.38	5.5	7.6	2.5	22.5
	1300	.3944	3.10	1.30	17.52	.98	8.80	9.29	5.5	7.5	3.0	28.0
	1500	.4085	7.51	3.12	27.09	1.52	16.88	17.81	6.0	7.6	5.7	53.8
	1700	.4307	11.75	6.50	48.77	2.05	37.11	30.70	8.6	10.8	10.4	101.5
	1900	.4744	12.35	8.72	48.71	1.76	33.23	35.97	8.7	10.6	11.0	108.3
2	100	.3625	.30	.15	4.79	.30	2.10	1.50	4.2	6.7	.7	5.9
	300	.3671	.91	.38	10.01	.61	4.55	3.79	5.1	7.5	1.5	13.3
	500	.3721	2.23	.92	15.76	.85	7.69	6.92	5.5	7.8	2.5	22.9
	700	.3770	3.27	1.40	18.85	1.01	9.66	9.19	5.7	7.7	3.1	29.2
	900	.3823	3.63	1.50	19.43	1.03	10.11	10.03	5.7	7.6	3.3	31.2
	1100	.3888	4.34	1.85	20.81	1.12	11.65	11.73	5.7	7.5	3.9	36.0
	1300	.3975	7.23	3.04	27.10	1.40	19.05	18.48	6.1	7.7	6.1	57.6
	1500	.4102	10.00	5.25	44.58	1.78	36.87	32.21	8.6	10.5	10.7	104.2
	1700	.4313	10.43	9.98	71.11	2.23	54.71	44.02	11.9	14.9	14.5	146.3
	1900	.4746	11.67	11.96	62.56	1.67	44.81	44.42	10.6	12.7	13.7	137.4
3	100	.3697	.61	.23	6.57	.46	3.06	2.22	4.1	6.3	1.0	8.7
	300	.3741	1.31	.54	11.52	.70	5.49	4.41	5.1	7.4	1.8	15.9
	500	.3775	2.50	1.01	16.85	.94	8.35	7.49	5.7	7.9	2.7	24.9
	700	.3805	3.77	1.57	20.36	1.10	10.85	10.22	5.8	7.9	3.5	32.4
	900	.3843	5.00	2.06	22.63	1.19	13.34	12.86	5.8	7.6	4.3	40.4
	1100	.3897	7.41	3.06	27.30	1.45	19.89	18.28	6.0	7.6	6.2	58.1
	1300	.3978	10.52	4.68	40.19	1.73	36.16	28.36	7.6	9.4	9.9	95.0
	1500	.4103	10.09	8.14	69.85	2.03	62.39	41.37	11.9	15.1	15.0	148.4
	1700	.4313	9.53	15.68	97.22	2.50	73.07	59.26	14.8	18.3	18.9	195.7
	1900	.4747	11.38	13.73	64.93	1.47	43.25	47.67	10.8	12.8	14.0	142.5

PREDICTED ION CONCENTRATIONS, ESP, SAR, EC, AND DISSOLVED CATIONS OF THE SOIL PROFILE FOR TREATMENT NO. 91 (WATER TABLE DEPTH 2000 MM; WATER TABLE EC 6 DS/M; CLAY LOAM SOIL; COTTON CROP; 04 DAYS IRRIGATION INTERVAL WITH IRRIGATION APPLICATION AMOUNT AS 0.75 OF ET)

End of Year	Depth (mm)	Theta (cm3/cm3)	Ca	Mg	Na	K	Cl	SO4	ESP	SAR	EC (ds/m)	Diss. Cat. (meq/l)
			-----	-----	-----	mmol/l	-----	-----				
1	100	.3705	.54	.23	7.35	.46	3.29	2.53	4.7	7.1	1.1	9.5
	300	.3733	2.55	1.08	16.66	.93	8.25	7.56	5.6	7.7	2.7	24.8
	500	.3722	3.31	1.38	18.46	1.00	9.46	9.23	5.5	7.5	3.2	29.3
	700	.3730	2.47	1.00	15.64	.85	7.63	7.63	5.4	7.4	2.6	23.7
	900	.3777	2.03	.86	14.44	.78	6.87	6.87	5.4	7.5	2.3	21.1
	1100	.3852	2.07	.88	14.64	.80	6.92	7.00	5.5	7.6	2.3	21.4
	1300	.3953	2.70	1.14	16.42	.90	7.92	8.58	5.6	7.5	2.8	25.6
	1500	.4092	5.66	2.37	22.57	1.27	12.01	14.96	5.7	7.4	4.6	42.9
	1700	.4310	11.58	5.08	34.73	1.87	22.17	27.61	6.6	8.0	8.3	80.1
	1900	.4745	12.45	6.76	38.53	1.76	25.20	32.45	7.3	8.7	9.6	93.3
2	100	.3756	.39	.16	5.59	.39	2.56	1.71	4.1	6.4	.9	7.2
	300	.3753	2.02	.85	15.20	.85	7.44	6.05	5.6	8.0	2.4	21.8
	500	.3729	4.16	1.77	21.88	1.16	11.63	10.48	5.9	7.9	3.7	34.7
	700	.3740	3.86	1.62	20.01	1.08	10.59	10.20	5.6	7.5	3.4	32.1
	900	.3789	3.13	1.25	17.61	.94	8.92	9.00	5.5	7.4	3.0	27.6
	1100	.3863	3.51	1.44	18.44	1.04	9.50	10.30	5.5	7.3	3.3	30.8
	1300	.3960	6.05	2.54	23.40	1.31	13.75	15.79	5.6	7.2	5.0	46.6
	1500	.4095	10.24	4.31	33.00	1.69	22.67	25.38	6.5	8.0	7.9	75.9
	1700	.4311	10.96	6.50	46.05	1.96	32.60	34.02	8.5	10.4	10.6	103.9
	1900	.4746	12.06	8.43	46.48	1.67	31.97	36.97	8.4	10.2	11.1	109.2
3	100	.3803	.86	.39	7.46	.55	3.77	2.51	3.9	5.8	1.3	10.5
	300	.3691	2.44	1.07	16.32	.92	8.39	6.48	5.5	7.7	2.7	24.2
	500	.3661	4.16	1.74	22.24	1.13	11.88	10.36	5.9	7.9	3.8	35.2
	700	.3706	4.36	1.84	21.52	1.15	11.64	11.03	5.7	7.6	3.7	35.1
	900	.3771	4.29	1.79	20.41	1.09	11.06	11.38	5.5	7.3	3.7	34.9
	1100	.3851	5.89	2.39	23.15	1.27	13.92	15.12	5.6	7.2	4.8	45.4
	1300	.3953	9.47	3.92	30.95	1.55	22.54	23.69	6.2	7.6	7.5	72.1
	1500	.4092	10.40	5.41	44.81	1.78	36.95	32.89	8.5	10.3	10.9	105.7
	1700	.4310	10.24	8.99	62.42	2.14	47.02	43.46	11.0	13.4	13.7	137.4
	1900	.4745	11.67	10.10	51.96	1.57	34.71	41.08	9.2	11.0	12.1	120.5

PREDICTED ION CONCENTRATIONS, ESP, SAR, EC, AND DISSOLVED CATIONS OF THE SOIL PROFILE FOR TREATMENT NO. 92 (WATER TABLE DEPTH 2000 MM; WATER TABLE EC 6 DS/M; CLAY LOAM SOIL; COTTON CROP; 04 DAYS IRRIGATION INTERVAL WITH IRRIGATION APPLICATION AMOUNT AS 0.50 OF ET)

End of Year	Depth (mm)	Theta (cm3/cm3)	Ca	Mg	Na	K	Cl	SO4	ESP	SAR	EC (ds/m)	Diss. Cat. (meq/l)
			mmol/l									
1	100	.3645	1.51	.60	11.90	.68	5.65	4.90	5.0	7.1	1.8	16.8
	300	.3671	3.03	1.29	17.44	.99	8.87	8.49	5.4	7.4	2.9	27.3
	500	.3685	2.36	.99	15.38	.84	7.54	7.46	5.3	7.3	2.6	23.5
	700	.3716	1.92	.77	13.90	.77	6.60	6.60	5.3	7.4	2.2	20.3
	900	.3773	1.87	.78	13.88	.78	6.55	6.55	5.4	7.5	2.2	20.0
	1100	.3850	2.07	.88	14.64	.80	6.92	7.08	5.4	7.6	2.3	21.5
	1300	.3952	3.18	1.31	17.56	.98	8.90	9.72	5.6	7.4	3.1	28.9
	1500	.4092	7.78	3.21	27.48	1.52	17.67	19.70	6.0	7.6	6.2	58.5
	1700	.4310	11.22	6.32	47.64	1.96	36.51	33.30	8.7	10.8	10.9	106.1
	1900	.4745	12.16	8.63	48.04	1.76	32.65	36.86	8.6	10.5	11.1	109.8
2	100	.3581	1.41	.59	10.95	.67	5.33	4.29	4.6	6.7	1.8	15.5
	300	.3623	3.59	1.50	19.69	1.05	10.40	9.28	5.5	7.5	3.3	31.0
	500	.3671	3.64	1.52	19.04	1.06	10.01	9.56	5.5	7.4	3.2	30.3
	700	.3726	2.69	1.15	16.24	.92	8.16	8.08	5.4	7.3	2.7	25.1
	900	.3790	2.82	1.17	16.44	.94	8.38	8.61	5.4	7.4	2.8	26.2
	1100	.3866	4.55	1.92	20.45	1.12	12.22	12.54	5.5	7.2	4.1	38.2
	1300	.3962	8.68	3.60	29.72	1.56	22.68	21.69	6.1	7.7	7.2	67.9
	1500	.4096	10.58	5.75	48.66	1.86	41.72	32.92	8.9	11.1	11.4	110.5
	1700	.4311	10.24	10.51	72.95	2.23	55.58	46.14	12.1	15.1	15.0	151.4
	1900	.4746	11.67	11.77	59.23	1.57	41.09	43.83	10.1	12.2	13.2	132.4
3	100	.3716	2.46	1.07	14.36	.84	7.68	6.14	4.8	6.7	2.5	22.3
	300	.3642	4.06	1.73	20.99	1.13	11.36	9.93	5.6	7.6	3.6	33.6
	500	.3653	3.92	1.66	20.00	1.06	10.72	10.11	5.5	7.4	3.4	32.2
	700	.3705	3.52	1.45	18.37	1.00	10.03	9.87	5.4	7.2	3.3	30.7
	900	.3771	4.60	1.95	20.41	1.17	12.86	12.47	5.4	7.0	4.2	38.8
	1100	.3851	7.56	3.10	26.89	1.43	21.80	19.65	5.9	7.3	6.7	62.9
	1300	.3953	9.64	4.74	41.98	1.63	40.18	31.61	8.2	10.0	11.1	106.3
	1500	.4092	9.81	8.54	72.37	2.11	64.42	43.46	12.3	15.6	15.5	154.7
	1700	.4310	9.44	15.94	95.73	2.49	71.06	59.84	14.6	18.0	18.7	194.7
	1900	.4745	11.37	13.53	62.94	1.47	41.67	46.96	10.6	12.5	13.8	139.4

PREDICTED ION CONCENTRATIONS, ESP, SAR, EC, AND DISSOLVED CATIONS OF THE SOIL PROFILE FOR TREATMENT NO. 93 (WATER TABLE DEPTH 2000 MM; WATER TABLE EC 6 DS/M; CLAY LOAM SOIL; WHEAT CROP; 14 DAYS IRRIGATION INTERVAL WITH IRRIGATION APPLICATION AMOUNT AS 0.75 OF ET)

End of Year	Depth (mm)	Theta (cm3/cm3)	Ca	Mg	Na	K	Cl	SO4	ESP	SAR	EC (ds/m)	Diss. Cat. (meq/l)
			mmol/l									
1	100	.3940	.08	.00	2.77	.16	1.14	.73	4.7	7.9	.4	3.1
	300	.4001	.33	.17	6.12	.33	2.56	2.07	5.5	8.6	.8	7.4
	500	.4015	1.08	.41	11.45	.66	5.06	4.65	5.7	8.4	1.7	15.1
	700	.3976	2.14	.90	15.77	.82	7.48	7.23	5.8	8.1	2.5	23.1
	900	.3911	2.75	1.13	17.29	.97	8.57	8.40	5.7	7.8	2.9	26.3
	1100	.3899	2.74	1.13	17.00	.97	8.38	8.38	5.6	7.7	2.8	25.9
	1300	.3967	2.79	1.15	16.88	.98	8.36	8.52	5.7	7.7	2.8	26.0
	1500	.4096	4.06	1.69	19.97	1.10	10.66	12.10	5.8	7.7	3.9	35.8
	1700	.4311	8.02	3.83	32.78	1.60	20.84	27.08	7.3	9.0	8.1	78.3
	1900	.4746	11.96	6.96	41.87	1.77	27.85	36.18	7.9	9.5	10.6	103.5
2	100	.3944	.08	.00	2.20	.16	.90	.49	4.2	7.1	.3	2.5
	300	.4008	.17	.08	4.14	.25	1.74	1.08	5.2	8.6	.6	4.8
	500	.4029	.50	.17	7.91	.42	3.33	2.58	5.7	8.8	1.1	9.7
	700	.4000	1.32	.58	12.73	.66	5.79	5.04	6.0	8.6	1.9	17.0
	900	.3941	2.36	.98	16.69	.90	8.06	7.57	5.9	8.2	2.6	24.3
	1100	.3923	3.32	1.38	18.97	1.05	9.65	9.65	5.8	7.9	3.2	30.0
	1300	.3980	4.52	1.89	21.54	1.15	11.84	12.75	5.8	7.7	4.1	38.6
	1500	.4102	7.54	3.22	29.15	1.44	18.22	20.85	6.5	8.2	6.5	62.0
	1700	.4312	10.69	6.50	48.47	1.96	32.70	35.81	9.0	11.0	10.9	107.5
	1900	.4746	11.77	9.32	53.44	1.67	36.97	40.69	9.6	11.6	12.3	122.0
3	100	.3948	.08	.00	1.96	.16	.90	.41	3.7	6.2	.3	2.3
	300	.4014	.08	.08	3.48	.25	1.49	.83	5.1	8.4	.5	4.0
	500	.4039	.25	.08	6.26	.33	2.67	1.75	5.7	9.0	.9	7.4
	700	.4018	.83	.33	10.38	.58	4.57	3.57	5.9	8.9	1.5	13.3
	900	.3966	1.80	.74	14.91	.82	7.05	6.31	6.0	8.4	2.3	20.9
	1100	.3943	3.26	1.38	19.23	1.06	10.02	9.78	5.9	8.1	3.3	30.7
	1300	.3991	5.52	2.31	24.82	1.32	14.68	15.58	6.2	8.0	5.0	47.4
	1500	.4106	7.89	3.90	36.48	1.61	24.60	26.13	7.9	9.8	8.3	80.1
	1700	.4314	10.34	8.29	59.45	2.05	41.45	41.80	10.6	13.0	12.8	128.4
	1900	.4747	11.48	11.18	61.50	1.67	43.45	45.21	10.7	12.8	13.7	137.5

PREDICTED ION CONCENTRATIONS, ESP, SAR, EC, AND DISSOLVED CATIONS OF THE SOIL PROFILE FOR TREATMENT NO. 94 (WATER TABLE DEPTH 2000 MM; WATER TABLE EC 6 DS/M; CLAY LOAM SOIL; WHEAT CROP; 14 DAYS IRRIGATION INTERVAL WITH IRRIGATION APPLICATION AMOUNT AS 0.50 OF ET)

End of Year	Depth (mm)	Theta (cm3/cm3)	Ca	Mg	Na	K	Cl	SO4	ESP	SAR	EC (ds/m)	Diss. Cat. (meq/l)
			mmol/l									
1	100	.3873	.32	.16	5.68	.32	2.40	1.92	4.9	7.6	.8	7.0
	300	.3907	1.21	.48	11.70	.65	5.25	4.84	5.5	8.0	1.7	15.8
	500	.3880	2.40	.96	16.19	.88	7.86	7.62	5.7	7.9	2.6	24.4
	700	.3820	2.68	1.10	16.73	.95	8.29	8.21	5.6	7.7	2.8	25.7
	900	.3805	2.44	1.02	15.72	.86	7.63	7.63	5.5	7.5	2.6	23.6
	1100	.3858	2.31	.96	15.38	.88	7.41	7.41	5.5	7.7	2.5	22.8
	1300	.3953	2.94	1.23	17.15	.98	8.66	8.98	5.6	7.6	2.9	27.1
	1500	.4092	6.93	2.87	26.21	1.44	16.15	17.16	6.0	7.7	5.5	51.8
	1700	.4310	11.49	6.32	48.35	2.05	36.69	31.70	8.6	10.8	10.5	103.0
	1900	.4745	12.16	8.92	50.69	1.76	35.00	37.45	9.0	11.0	11.5	113.3
2	100	.3878	.32	.16	5.21	.32	2.24	1.60	4.5	7.1	.8	6.4
	300	.3915	1.13	.49	11.16	.65	5.10	4.29	5.4	8.0	1.7	15.0
	500	.3891	2.49	1.05	16.80	.88	8.20	7.56	5.8	8.0	2.7	24.7
	700	.3833	3.25	1.35	18.93	1.03	9.58	9.34	5.8	7.8	3.2	29.5
	900	.3815	3.39	1.42	18.76	1.02	9.70	9.70	5.6	7.6	3.2	30.0
	1100	.3864	4.23	1.76	20.28	1.12	11.42	11.50	5.6	7.4	3.8	35.3
	1300	.3957	7.52	3.11	27.22	1.47	19.13	18.89	6.0	7.5	6.2	58.5
	1500	.4094	10.49	5.33	44.92	1.78	38.06	32.57	8.5	10.4	10.9	106.2
	1700	.4310	10.42	10.42	75.60	2.32	59.66	45.33	12.5	15.7	15.3	154.0
	1900	.4745	11.67	12.06	61.27	1.67	41.96	44.21	10.4	12.5	13.3	134.0
3	100	.3881	.32	.16	5.05	.32	2.25	1.52	4.2	6.7	.8	6.3
	300	.3920	1.13	.49	11.10	.65	5.18	4.13	5.3	7.9	1.7	15.0
	500	.3899	2.58	1.13	17.56	.97	8.70	7.73	5.9	8.2	2.8	25.9
	700	.3843	3.97	1.67	21.12	1.11	11.27	10.64	6.0	7.9	3.6	33.9
	900	.3823	5.13	2.13	22.91	1.18	13.59	13.11	5.8	7.6	4.4	41.2
	1100	.3869	7.27	3.04	26.86	1.44	19.42	18.23	5.9	7.5	6.1	57.6
	1300	.3960	8.43	4.01	37.23	1.55	33.79	28.55	7.8	9.6	9.8	93.9
	1500	.4095	10.07	7.53	64.98	2.03	57.28	39.85	11.3	14.2	14.2	140.2
	1700	.4311	9.53	15.41	96.91	2.49	74.37	58.61	14.8	18.3	18.9	195.5
	1900	.4746	11.37	14.22	67.76	1.57	46.09	48.54	11.2	13.2	14.5	147.1

PREDICTED ION CONCENTRATIONS, ESP, SAR, EC, AND DISSOLVED CATIONS OF THE SOIL PROFILE FOR TREATMENT NO. 95 (WATER TABLE DEPTH 2000 MM; WATER TABLE EC 6 DS/M; CLAY LOAM SOIL; WHEAT CROP; 04 DAYS IRRIGATION INTERVAL WITH IRRIGATION APPLICATION AMOUNT AS 0.75 OF ET)

End of Year	Depth (mm)	Theta (cm3/cm3)	Ca	Mg	Na	K	Cl	SO4	ESP	SAR	EC (ds/m)	Diss. Cat. (meq/l)
			mmol/l									
1	100	.3736	.39	.15	5.79	.39	2.55	1.78	4.6	7.1	.8	7.2
	300	.3747	1.86	.77	14.40	.77	6.89	6.12	5.5	7.8	2.2	20.5
	500	.3729	3.08	1.31	18.03	1.00	9.17	8.86	5.5	7.6	3.1	28.4
	700	.3738	2.55	1.08	15.99	.85	7.88	7.80	5.4	7.4	2.6	24.3
	900	.3784	2.11	.86	14.62	.78	6.96	6.96	5.4	7.5	2.3	21.4
	1100	.3857	2.07	.88	14.66	.80	7.01	7.01	5.5	7.7	2.3	21.4
	1300	.3956	2.45	1.06	15.86	.90	7.76	8.09	5.6	7.6	2.7	24.4
	1500	.4093	4.40	1.78	20.13	1.18	10.99	13.95	5.8	7.4	4.3	40.0
	1700	.4310	9.71	4.01	30.63	1.60	20.57	33.93	6.6	7.7	9.5	91.5
	1900	.4745	10.78	6.18	37.94	1.67	24.90	44.21	7.8	9.1	12.0	117.2
2	100	.3770	.47	.16	5.76	.39	2.65	1.71	4.1	6.4	.9	7.4
	300	.3791	2.11	.86	15.51	.86	7.68	6.27	5.6	8.0	2.5	22.3
	500	.3777	3.82	1.64	21.07	1.09	11.08	10.07	5.9	8.0	3.5	33.1
	700	.3776	3.43	1.40	18.88	1.01	9.75	9.52	5.6	7.6	3.2	29.9
	900	.3809	2.83	1.18	16.84	.94	8.42	8.66	5.5	7.5	2.9	26.4
	1100	.3872	3.28	1.36	17.68	.96	9.12	10.48	5.5	7.4	3.3	30.9
	1300	.3964	5.57	2.29	22.03	1.23	13.02	17.61	5.7	7.1	5.3	49.7
	1500	.4097	9.82	4.06	30.90	1.61	21.84	31.15	6.4	7.6	9.0	86.7
	1700	.4311	10.06	5.79	45.34	1.78	33.94	40.79	9.0	10.8	12.1	119.0
	1900	.4746	11.57	8.53	46.68	1.67	31.48	40.89	8.7	10.3	11.8	116.7
3	100	.3797	.47	.24	5.65	.39	2.67	1.73	3.8	5.9	.9	7.5
	300	.3826	2.29	.95	16.21	.87	8.22	6.40	5.6	8.0	2.6	23.7
	500	.3815	4.49	1.89	23.57	1.18	12.69	11.11	6.1	8.3	4.0	37.6
	700	.3806	4.48	1.89	22.02	1.18	11.95	11.64	5.8	7.7	3.9	36.6
	900	.3828	4.19	1.74	20.17	1.11	11.07	12.18	5.6	7.4	3.9	36.5
	1100	.3883	5.62	2.33	22.30	1.20	13.56	16.85	5.6	7.1	5.2	48.6
	1300	.3970	8.86	3.69	28.95	1.48	20.75	25.51	6.1	7.4	7.8	74.0
	1500	.4099	10.67	5.08	40.99	1.78	32.10	30.57	7.8	9.5	9.9	96.1
	1700	.4312	10.07	8.02	57.64	2.05	43.21	44.37	10.5	12.8	13.6	135.4
	1900	.4746	11.57	10.10	52.36	1.57	35.50	42.56	9.3	11.2	12.5	124.3

PREDICTED ION CONCENTRATIONS, ESP, SAR, EC, AND DISSOLVED CATIONS OF THE SOIL PROFILE FOR TREATMENT NO. 96 (WATER TABLE DEPTH 2000 MM; WATER TABLE EC 6 DS/M; CLAY LOAM SOIL; WHEAT CROP; 04 DAYS IRRIGATION INTERVAL WITH IRRIGATION APPLICATION AMOUNT AS 0.50 OF ET)

End of Year	Depth (mm)	Theta (cm3/cm3)	Ca	Mg	Na	K	Cl	SO4	ESP	SAR	EC (ds/m)	Diss. Cat. (meq/l)
			----------	----------	----------	mmol/l	----------	----------				
1	100	.3754	.85	.39	9.00	.54	4.03	3.34	4.9	7.2	1.3	11.9
	300	.3760	2.41	1.01	15.85	.85	7.77	7.38	5.5	7.6	2.6	23.8
	500	.3726	2.46	1.00	15.70	.85	7.70	7.62	5.4	7.4	2.6	24.2
	700	.3726	2.00	.85	14.24	.77	6.77	6.77	5.3	7.4	2.3	20.9
	900	.3772	1.95	.78	14.03	.78	6.62	6.62	5.4	7.5	2.2	20.3
	1100	.3847	2.07	.87	14.62	.79	6.99	6.99	5.5	7.6	2.3	21.5
	1300	.3950	3.02	1.22	17.14	.98	8.73	9.22	5.5	7.5	3.0	27.8
	1500	.4091	7.02	2.96	26.20	1.44	16.74	19.36	6.1	7.6	6.0	56.9
	1700	.4310	10.69	5.97	46.84	1.96	36.07	35.98	8.8	10.9	11.4	111.2
	1900	.4745	11.86	8.33	48.04	1.76	33.14	37.06	8.8	10.6	11.2	109.4
2	100	.3762	1.17	.47	10.10	.62	4.82	3.81	4.7	6.8	1.6	14.1
	300	.3770	3.19	1.32	18.62	1.01	9.58	8.57	5.7	7.8	3.1	28.6
	500	.3736	3.16	1.31	18.06	1.00	9.19	8.88	5.6	7.5	3.0	28.2
	700	.3732	2.47	1.00	15.73	.85	7.79	7.79	5.4	7.4	2.6	24.0
	900	.3776	2.65	1.09	16.07	.94	8.11	8.27	5.4	7.3	2.8	25.3
	1100	.3851	4.14	1.67	19.49	1.11	11.30	12.01	5.5	7.2	3.9	36.3
	1300	.3953	7.84	3.27	27.61	1.47	20.66	21.89	6.0	7.5	7.0	66.4
	1500	.4092	9.98	5.24	45.32	1.78	39.57	36.35	8.8	10.7	11.9	115.4
	1700	.4310	10.15	10.15	73.38	2.23	57.79	47.20	12.4	15.4	15.4	155.7
	1900	.4745	11.57	11.37	57.45	1.57	38.23	43.14	9.9	11.9	12.8	127.7
3	100	.3765	1.48	.62	11.05	.70	5.52	4.28	4.6	6.7	1.8	15.9
	300	.3774	3.98	1.72	21.13	1.09	11.38	9.90	5.8	7.9	3.6	33.7
	500	.3740	4.10	1.70	20.79	1.08	11.20	10.59	5.7	7.6	3.6	33.7
	700	.3735	3.55	1.47	18.52	1.00	10.11	10.11	5.4	7.3	3.4	31.2
	900	.3778	4.53	1.87	20.22	1.09	12.72	12.96	5.4	7.0	4.3	39.7
	1100	.3852	7.64	3.18	26.66	1.43	21.09	20.29	5.8	7.2	6.8	63.4
	1300	.3953	10.54	4.82	40.51	1.72	37.16	29.08	7.6	9.4	10.2	98.1
	1500	.4092	9.72	7.69	66.54	2.03	58.51	43.03	11.7	14.6	14.9	147.9
	1700	.4310	9.44	14.96	92.61	2.49	69.81	58.77	14.3	17.7	18.5	191.3
	1900	.4745	11.37	13.33	62.16	1.47	40.69	46.76	10.5	12.4	13.6	138.0

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VITA

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Doctor of Philosophy

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