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PEDOLOGICAL AND AGROCHEMICAL ASPECTS REGARDING AGRICULTURAL FIELDS OF S.C. CELCO S.A. GREENHOUSES, CONSTANTA COUNTY

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Abstract

The present scientific paper has as objective the characterization of the agrarian land from S.C. Celco S.A. greenhouses, Constanta county, in terms of its principal nutrients supply, soil reaction and soluble salts total content, in order to apply a rational and distinctive fertilization for each greenhouse crop. As the purpose was achieved, it required a few itineracies to the greenhouses location, necessary for collecting environmental data and for establishing the position of the settlement in according with all influence factors; also, protected crop areas have been identified, soils have been morphologically described through open soil profiles, agrochemical and pedological samples have been prevailed and laboratory analysis were made; then, results have been estimated and appreciated in accordance with the specific methodology.

INTRODUCTION

The fields as part of S.C. Celco S.A greenhouses are located in Constanta city limitrophe area, at West - North West part, covering a surface which once belong to Constanta county and later on has been bought by S.C. Celco S.A agrary unit. The new arranged surface has 3600 square meters and is represented by greenhouse I and greenhouse II (G I and G II). Entire pedological and agrochemical analysis was based on a study contract between Agrary Science Department from Ovidius University of Constanta and S.C. Celco S.A. unit.

MATERIAL AND METHODS

The study consisted of two stages: preliminary stage and field stage. During preliminary stage, information provided by previous studies regarding the researched area has been consulted and also, topographic materials and pedologic maps have been used, in order to characterize relief, ground water, parental material and climate. During field stage greenhouses landing position was identified and, in the same time, plots for prevailing samples were set up, everything with the acceptance of the contract beneficiary. For each of the two greenhouses, a pedologic profile has been opened, respectively profile 1 (P 1) at greenhouse I and profile 2 (P 2) at greenhouse II, which have been described until

125-130 cm depth. Also, a number of 9 samples at G II and 6 samples at G I have been prevailed (prevailing was made at arable layer level). Some of soil samples analysis were made at Pedology and Agrochemistry Laboratory from Ovidius University of Constanta and the rest at Agrochemistry and Plant Nutrition Laboratory from ICPA Bucharest. Soils samples analysis first consisted of drying, crumbling and sifting processes, necessary before any other determination. Determinations consisted of:

a. soil reaction (pH) - potentiometric determination in water suspension;
b. determination of humus content (H%) using Wakley Black method (with modified elements by Gogoasa);
c. total nitrogen content (N tot);
d. determination of phosphorus and potassium soil content – in ammonium acetate extract using Egner-Riehm-Domingo method;
e. determination of soluble salts total content (electric conductivity);
f. determination of soluble salts structure (HCO^{3-}, SO^{4-}, Cl^{-}, Ca^{2+}, Mg^{2+}, Na^{+}, K^{+}).

RESULTS AND DISCUSSION

The field stage has reliefied that agrary fields from S. C. Celco S. A. are characterized by an accentuated human modification, due to some constructive assembles destinated for storage and agrary using, a fact which required the necessity of human intervention through alingments and access road arrangements. Soils parental material is represented by loess deposits until 10 meters depth, followed by a clay-loamy-clay complex, with reddish clay insertions. As for mineral composition, the researched layer is loamy, loamy-clay until the parental material. Ground water is located at 4.3-5.1 m depth, influencing pedogenetic processes. As for climate, the collected data indicate 11,3ºC annual medium temperatures and 400 mm medium rainfalls/year. As climate special phenomenon the dew effect can be mentioned, manifested during warm season through a pluvial supply of 50 mm per year. Secondary, meteorological risk phenomenon may appear (like hail, storms, aridity-last of them shall lead to increased demineralization of soils).

Soils of the two protected spaces (G I and G II) belong to Cernisols Class, coresponding to fertile and very fertile soils domain. At first greenhouse G I, a soil profile was opened until 130 cm depth and its morpfologic features have been described (table 1). The soil is chernozem type, with soil formula **CZ K3 S2 l/l**. At G II greenhouse, the soil profile has been studied until 125 cm depth. Its morphologic features indicated that soil type is chernozem, cambic subtype, with soil formula **CZ cb K4 S2 la/l** (table 2).

Table 1

Morphologic description of CZ K3 S2 l/l soil profile

Horizon	Depth (cm)	Morphologic characteristics
Ap	0-20	soil material with plants input brought up after the land alignment (the alignment was husing 40 soil cm and land was completed with other 20 cm input), loamy-loamy dust texture (LL-LP), dark colour
Am	20-39	loamy texture (LL), 10YR 3/3 colour, molic nuance, soil material is less compact, gradual passing to the next soil horizon
Amca	39-54	loamy texture (LL), 10YR 3/3 colour, calcium carbonate spots can be observed under first 50 cm of soil, spongy material, moderate humidity, gradual passing
A/Cca	54-70	loamy texture (LL), 10YR 3,5/3,5 colour, partly crumbly, spongy and wet material, increased efervescence at soil horizon base, less compact soil layer, gradual passing
C_1ca	70-90	loamy texture (LL), 10YR 4,5/4 colour, numerous whitish spots have been identified covering soil structural elements, sulfury traces, wet, crumbly material, gradual passing
C_2ca sc	90-110	loamy texture (LL), 10YR 4/3,5 colour, wet, crumbly, whitish material, with sulfury traces, small and moderate $CaCO_3$ accumulations, gradual passing to parental material
C	110-130	loamy texture, loessic material

Table 2

Morphologic description of CZ cb K4 S2 la/l soil profile

Horizon	Depth (cm)	Morphologic characteristics
Ap	0-21	material with vegetable soil input brought after land alignment, loamy-dusty-loamy-clayey texture (LP-LA), dark colour, 10 YR 3/2, wet, plastic and adherent, with humidity due to dropping irrigation, gradual passsing
Am	21-39	loamy-dusty-loamy-clayey texture (LP-LA), 10YR 3,5/3 colour, compact, without any structure soil material, gradual passing to the next soil horizon
A/Bv	39-61	loamy texture (LL), 10YR 3/3 colour, small angular blocky structure, wet soil material, gradual passing
Bv (sc)	61-85	loamy-dusty-loamy-clayey texture (LP-LA), 10YR 3,5/3,5 colour, wet material, on soil agregates isolated whitish sulphury accumulations can be observed, gradual passing
Bv/Cca sc	85-105	loamy texture (LL), 10YR 4/4 colour, carbonates accumulation in horizon superior part, low traces of sulphatic salts to horizon base, increased efervescence
Cca sc	105-125	loamy texture (LL), 10YR 5/4 colour, dry, $CaCO_3$ accumulation
C	peste 125	loamy texture, loessic parental material

In the laboratory stage a few of the agrochemical indicators have been determined, all in accordance with analysis methodology provided by ICPA Bucharest. Thus, in order to estimate the type of soil salinization, the ratio between Cl^- and SO_4^{2-} ions was calculated (m.e./100 soil g). At the first greenhouse G I the ratio is 3.75 m.e./100 soil g (Cl^-/SO_4^{2-} = 2.33/0.49 = 3.75). At second greenhouse G II the ratio Cl^-/SO_4^{2-} = 2.61 m.e./100 soil g. The calculations reliefy that soil salinization type is gypsium chloride at both greenhouses.

Exchangeable Na content at sample susceptible to salinization collected from greenhouse I (0-20 cm depth) is 15.2 mg/100 soil g (appreciated as very high). At G II, profile 2, at 0-20 cm depth, exchangeable Na content is 70.2 mg/100 soil g (extremely high). Alkalinity content estimated based on HCO_3 value, at sample susceptible to salinization collected from greenhouse I is 0.65 m. e./100 soil g. At sample collected from G II, P 2, alkalic content estimated based on HCO_3 value is medium, respectively 2.62 m.e./100 soil g, on 0-20 cm depth.

At G I and G II, soil pH has values between 8.33 – 8.86, reflecting this way the soil alkalinity (table 3 and figure 3). Humus content at G I, P1 (on 0-20 cm depth) is between 3.1-3.3% (appreciated as medium) and 17.2% (appreciated as very high) at mineral-organic material from G II, P2.

Table 3

Analytical data corresponding to S.C. CELCO S.A.

Pedologic profile Greenhouse G I			**Pedologic profile Greenhouse G II**		
Depth (cm)	**pH**	**Soluble salts [S/cm**	**Depth (cm)**	**pH**	**Soluble salts [S/cm**
0-20	8.86	313 (low salinizated)	0-20	8.46	2260 (accentuated salinization)
25-35	8.33	263 (low salinizated)	20-35	8.36	301 (low salinizated)
40-60	8.64	205 (low salinizated)	40-50	8.63	319 (low salinizated)
75-85	8.26	240 (low salinizated)	60-70	8.65	399 (low salinizated)
90-105	8.64	198 (low salinizated)	70-90	8.60	419 (low salinizated)
110-125	8.68	266 (low salinizated)	90-110	8.73	356 (low salinizated)
-	-	-	110-130	8.75	339 (low salinizated)

Macronutrients supply can be presented as follows:

- total nitrogen (N_{tot}) has medium values at G I, P 1 (0.156-0.166%) and very high values at mineral-organic soil material from G II, P2, on 0-20 cm depth (figure 1);
- P_2O_5 varies from 17 ppm (low) to 48-38 ppm (high) on the two soil horizons (0-20 and 25-35 cm) from G I, profile 1; at mineral-organic soil material from G II, P 2 it is 284 ppm (appreciated as very high) and 6 ppm (appreciated as very low) at 25-35 depth of the same soil profile (figure 2);

- K_2O values are high and very high at each analysed sample (values from 280 to 442 ppm); also, we have determined here an extremely high value of K_2O content (5285 ppm) at P 2 sample, greenhouse II, collected from 0-20 cm depth (where mineral-organic material lies) (figure 2).

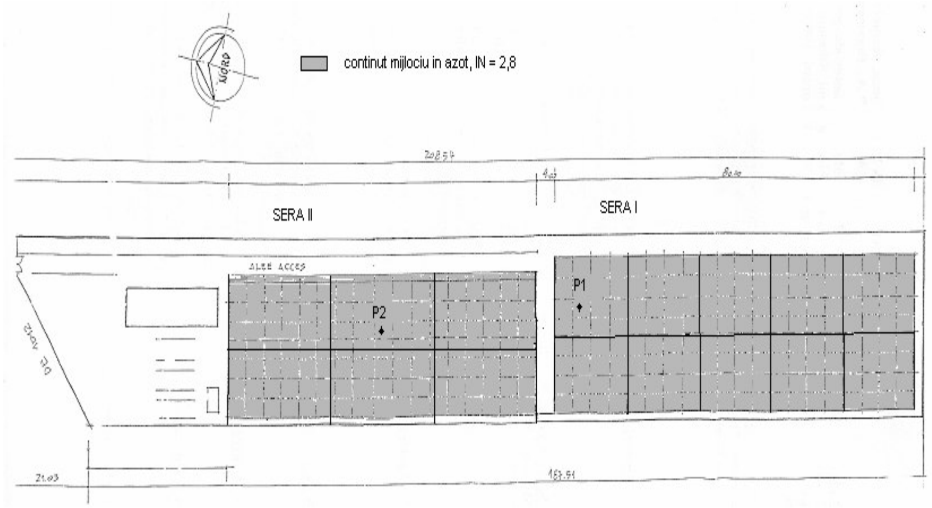

Fig. 1. Soil nitrogen supply (G I and G II)

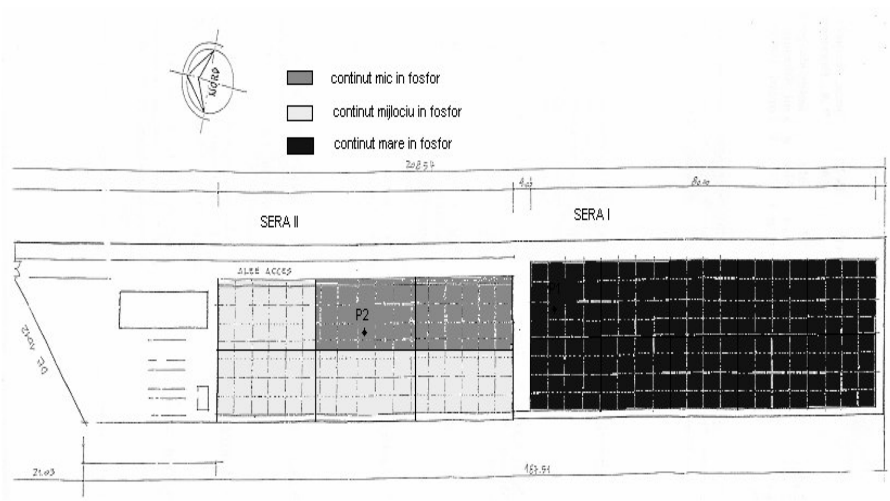

Fig. 2. Soil mobile phosphorus supply (G I and G II)

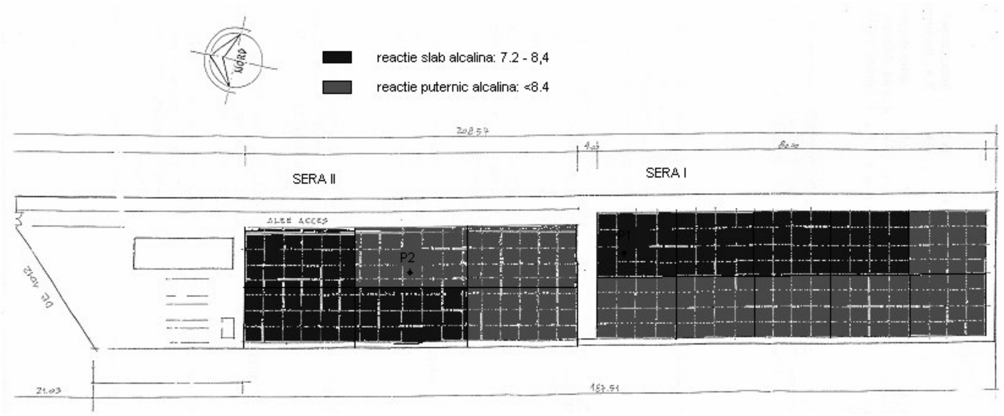

Fig. 3. Soil reaction at the two greenhouses

In order to emphasize the analysis results, the surface on which soil samples were prevailed has been divided in uniform agrochemical plots, according to figures 1-3; for each uniform plot, agrochemic synthetic situation have been elaborated and results were framed in classes of agrochemic indicators estimation.

CONCLUSIONS

1. The results reliefy that both greenhouses fields are affected by salinization; the salinization is chloride type, with low intensity syptoms at soil level.
2. Exchangeable Na has high and extremely high values on 0-20 cm depth for both greenhouses.
3. Soil pH according to profiles 1 and 2 varies from low to medium alkaline.
4. Soil nitrogen supply, characterized by NI (nitrogen indicator) is medium on 100% surface.
5. Soil mobile phosphorus supply is low on 10%, medium on 30% and high on 60% of surface.
6. Soil mobile potassium supply is very good on 100% of the whole surface.

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