# THE IMPORTANCE OF HYDRO-PHYSICAL CHARACTERISTICS OF THE EDAPHIC COATING IN SUBSTANTIATION OF CONSERVATIVE TILLAGE SYSTEMS

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***Abstract:*** *The purpose of the research undertaken has its origins in the current scientific and practical concerns increasingly hard to identify and set up a tillage system, agronomicaly efficient, financial and reduced energy costs, environmental friendly to replace the classic system. The objectives and activities fall within the current agricultural research and agricultural practice, on international and national level, for the study of the importance of hydro-physical characteristics of the edaphic coating in substantiation of conservative tillage systems. From the geomorphological point of view the perimeter of the investigated area belongs to the large physical–geographic unity called the Vinga High Plain. That is the oldest and the most complex among Banat-Crisana plains and extends south of Mures everglade, west of Lipova hills, north of Bega low plain, east of Galatca plain. There are presented physico-geographical conditions of soil formation and evolution, based on judiciously selected reference to the conditions of relief, geology and lithology of surface materials, hydrography and hydrology, climate and vegetation conditions. Soil's texture is medium clay on the whole profile. The Apparent Density (DA) has medium values in the worked layer from the classic system, high in the first 10 cm in no-till system and very high in the middling third of the soil profile in the two systems. The Total Porosity (PT) has low values in the 0 – 33 cm interval, and also in the 45 – 96 cm one. The aeration porosity has very low values, excepting the worked layer from the classic system, where it has low values and the first 10 cm depth in No-till system where the values are very low. From the analysis of climate data results a large variability of rainfall fell from year to year and from one period to another feature, thus optimal precipitation amounts between 1992-2010 were recorded in only four agricultural years (26,6%). Soil moisture values were closely related to the amount of rainfall recorded in the area. Considering the evolution of soil moisture in the period 2005-2010 the observations made monthly (by taking soil samples and laboratory determinations) shows that the values from cultures in no-tillage system are the more uniform values in the soil profile.*

***Keywords:*** *soil, moisture, properties, Vinga plain, no-till*

## INTRODUCTION

Cultivating the agricultural fields by using incomplete and incoherent technologies seriously damages both quantitatively and qualitatively not only the production but especially the soil resources, the practice proving that in order to function the little or large agricultural cultivation, the main condition is the choice of the most suitable technologies.

The no-till technology belongs to the agricultural systems that have the role to conserve the soil, being known in the modern agriculture from the 1950s when on the American continent were settled up the technologies with minimum works in order to find some practical methods for reducing and stopping the soil erosion, a phenomenon that was more and more aggressive on the fields cultivated as an conventional system (DERPSCH, 2000).

No-tillage or zero tillage is a farming system in which the seeds are directly deposited into untilled soil which has retained the previous crop residues.

Some of the environment relevant effects of no-tillage as erosion control, improvement of water quality, increased water infiltration which leads also to reduced flood hazard and climate related consequences through carbon sequestration in the soil, will come into effect only after several years of continuous, uninterrupted application (GUȘ et al., 2003).

The no-tillage technology is being applied globally on over 100 Million ha under the most diverse climate and soil conditions (DERPSCH, et al., 2010).

The no-till system is very effective to increase soil water infiltration, to reduce evaporation from soil and also to reduce water run-off. The water availability for crops is increased, offering the opportunity to improve general soil functioning and crop performance. The principles are equally useful for either rain-feed or irrigated cropping condition. Under rain-feed, No Till greatly contribute to minimize the yield impacts caused by water stressing periods allowing to obtain higher and less variable crop yields (GUȘ et al., 2003).

The passing to no-till system change the structure of technological elements, through less soil works, so the impact on agro-system is different comparing with conventional tillage, first lessing the intervention pressure on agro-system ant secondly appears new interactions, new equilibriums and disequilibrium.

## MATERIALS AND METHODS

Our research relates to an area of 141,249 ha. (72721 ha. in Timis County and 68,528 hectares in Arad County), owned by territories located in Vinga Plain and its connection to the low plains or Lipova hills.

The research of the ecopedologic conditions was made according to "The methodology of elaborating of pedological studies", vol. I, II and III elaborated by the ICPA Bucharest in 1987, completed with specific elements from the Romanian System of Taxonomy of Soils (SRSTS-2003).

To determine physical and chemical properties of soil, more samples were collected in both natural settlement (to determine the apparent density) and a settlement disturbed (to determine other properties).

Preparation, analysis of probes and interpretation of results were done in OSPA Timis and USAMVB Timisoara labs.

## RESULTS AND DISCUSSIONS

From the geomorphological point of view the researched perimeter belongs to the large physical–geographic unity called the Vinga High Plain.

Vinga high plain is the oldest and the most complex among Banat-Crisana plains and extends south of Mures everglade, west of Lipova hills, north of Bega low plain, east of Galatca plain. It is formed at the convergence of hills glacisist, shaped by a net of flowing waters and erosion valleys.

Their origin is attributed to great Pleistocene Mures delta, which converged here with Panonic Lake at the biginning of cuaternar. Deep deposits point on aluvo-torrential formation composed of sands and gravel, alternating with clays and silt. Surface cover is made of loessoid a deposit, settled at different phases in alternation to fossil soils. Relief present itself as a succession of high plain, almost even, with altitudes between 95-200 m , separated by wide valleys, rather deep, collected quite in exclusivity by Berecsau river (and less by Mures river).

The zone between the rivers are well individuated in 5 steps layed in fan shape: Seceani (180 m), Alios (160 m), Vinga (150 m), Calacea (130 m), Satchinez (100 m) realized by Mures river at different geological moments an partly tectonically influenced.

It was set up as an accumulative erosive foot of hills, being located between the Lipova Plateau and the Low Subsidence Plain in the west of Romania. The zone in which are situated the experiments is located in the NW sector of the Vinga High Plain, above the 3rd embankment of the Mures river, from the alignment Tisa Noua, Felnac, Secusigiu, 100-120 m altitude. The geological evolution of the zone is in strong relation with the one of the Panonic Depression to which actually it belongs. This depression was created on the basis of the sinking, during the geological eras, of a Hercynian lake.

The hydrography of the space on which are situated the experiments belongs to the Mures hydrographical area flowing at approximately 2-3 km N from them. The pedophreatic level can be found at depths of 5.1-10.0 m in plain zones and of 1.5-3.0m on the valleys.

The climate is a temperate-continental one with Mediterranean influences, the medium multi-annual temperature being of 10,4 $^0$C and the multi-annual rainfall 593,5 mm (Table 1).

*Table 1*

Monthly, yearly and multi-annual medium temperature ($^0$C) and precipitations (mm) at Arad station

| Year | Month | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | IX | X | XI | XII | I | II | III | IV | V | VI | VII | VIII | Yearly |
| Temperatures | | | | | | | | | | | | | |
| 05--06 | 16,0 | 13,0 | 3,0 | 1,0 | -1,9 | -0,7 | 4,2 | 12,2 | 15,9 | 19,2 | 23,1 | 19,6 | 10,4 |
| 06--07 | 17,1 | 12,0 | 6,9 | 2,0 | 4,2 | 5,2 | 8,1 | 12,1 | 17,9 | 22,1 | 24,3 | 22,9 | 12,9 |
| 07--08 | 14,5 | 10,2 | 3,8 | -0,4 | 1,1 | 3,2 | 7,0 | 11,7 | 17,1 | 21,8 | 22,1 | 21,7 | 11,1 |
| 08--09 | 15 | 12 | 6,6 | 3,3 | -1,6 | 0,7 | 5,9 | 14 | 17,6 | 20 | 23,2 | 22,9 | 11,6 |
| 09--10 | 18,9 | 11,2 | 7,5 | 2,8 | -0,8 | 2,4 | 6,3 | 11,7 | 16,9 | 19,9 | 22,5 | 21,7 | 11,8 |
| normal | 16,3 | 10,7 | 5,3 | 0,6 | -1,8 | 0,8 | 5,4 | 10,9 | 16,0 | 19,0 | 20,8 | 20,2 | 10,4 |
| Precipitations | | | | | | | | | | | | | |
| 05--06 | 82,6 | 17,4 | 29,0 | 26,4 | 25,6 | 36,8 | 64,6 | 53,2 | 74,2 | 95,6 | 65,3 | 81,8 | 652,5 |
| 06--07 | 23,9 | 13,4 | 25,3 | 25,2 | 28,8 | 77,0 | 44,1 | 0,0 | 82,4 | 58,8 | 30,5 | 45,8 | 455,2 |
| 07--08 | 87,6 | 45,6 | 102,7 | 32,4 | 17,6 | 10,5 | 71,0 | 24,4 | 33,7 | 43,2 | 38,7 | 50,2 | 557,6 |
| 08--09 | 45,7 | 18,6 | 56,5 | 48,1 | 17,6 | 10,5 | 44,5 | 40 | 46,2 | 78,4 | 37,2 | 29,8 | 473,1 |
| 09--10 | 12,8 | 96,2 | 112,6 | 64,3 | 67,5 | 71,8 | 34,0 | 47,4 | 140 | 83,8 | 60,0 | 69,2 | 859,6 |
| normal | 44.2 | 46.6 | 48.5 | 45.3 | 35.1 | 30.9 | 35.6 | 48.1 | 65.6 | 81.1 | 60.3 | 52.2 | 593.5 |

According with Romanian Taxonomic System of Soils (SRTS 2003) and WRB for SR 1998, in researched area have been identified 8 classes of soils, 12 types, 40 subtypes, 153 detailed units, which are different through their propertys, their productiv capacity and measures for maintainance and increase their fertility (Table 2).

*Table 2*

Main soil types and associations from Vinga Plain

| Crt. No. | Soil types (WRB-1998) | TEO | Surface | |
|---|---|---|---|---|
| | | | (ha) | (%) |
| 1 | Fluvisols | 1-16 | 6.141,15 | 4,36 |
| 2 | Chernozems | 17-29 | 49.047,53 | 34,76 |
| 3 | Phaeozems | 30-39 | 11.985,71 | 8,49 |
| 4 | Eutric cambisols | 40-65 | 9.469,52 | 6,72 |
| 5 | Halpic luvisols | 66-107 | 45.572,45 | 32,19 |
| 6 | Luvisols | 108-114 | 3.367,88 | 2,39 |
| 7 | Vertisols | 115-121 | 4.953,00 | 3,51 |
| 8 | Gleysols | 122-135 | 4.138,15 | 2,93 |
| 9 | Stagnic luvisol | 136-139 | 821,52 | 0,58 |
| 10 | Solonetz | 140-142 | 336,14 | 0,24 |
| 11 | Erodosols | 143-151 | 4.817,21 | 3,41 |
| 12 | Anthrosols | 152-153 | 598,74 | 0,42 |
| TOTAL | | | 141.249 | 100 |

The land use is dominated by arable land occupying often amounts exceeding 80% (Şagu 88.51%, 88.43% Fântânele, Ortisoara 84.34%), or 90% of farmland (Felnac 97.50%, Zădăreni 95.12%, Dumbravita 92.98%, Frumuseni 92.40%).

The forest is very poorly represented (Dumbravita 0.11%, Giarmata 0.22%, Ortisoara 0.39%, Şagu 0.74%, Vinga 0.79%), leaving a few small areas in some meadows, especially on the Mures (Fântânele 2.15%, Zădăreni 3.18%, Felnac 8.65%, Zabrani 16.68%) or Beregsău and Magherus (Pischia 15.88%).

As a result of the cosmic-atmospheric and telluric factors intervention, under vegetation specific to the forest steppe, in the zone were created cambium chernozems, specific to the researched perimeter (Table 3).

*Table 3*

Phisical, hidro-phisical and chemical properties of Cambium Chernozem from Arad

| Horizonts | UM | Ap | Atp | Am | A/B | Bv | B/C | Cca | Ck | Ck | Ck |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Deepness | cm | 21 | 33 | 45 | 59 | 80 | 96 | 125 | 155 | 175 | 200 |
| Coarse sand (2.0 – 0.2 mm ) | % | 0.8 | 0.7 | 0.4 | 0.2 | 0.3 | 0.2 | 0.2 | 0.5 | 0.8 | 0.7 |
| Fine sand (0.2 – 0.02) | % | 30.3 | 26.9 | 29.2 | 37.4 | 32.8 | 29.9 | 28.1 | 31.4 | 31.4 | 27.6 |
| Silt (I + II) ( 0.02-0.002 mm) | % | 29.5 | 33.5 | 28.0 | 23.5 | 27.5 | 29.5 | 34.1 | 25.8 | 24.9 | 29.8 |
| Coloidal clay ( sub 0.002) | % | 39.4 | 38.9 | 42.4 | 38.9 | 39.4 | 40.4 | 37.5 | 42.3 | 42.9 | 42.0 |
| Phisical clay (praf II +arg col) | % | 52.4 | 52.9 | 56.9 | 49.9 | 53.9 | 51.4 | 55.1 | 55.7 | 54.8 | 55.9 |
| *TEXTURE* | | TT | TT | TT | TT | TT | TT | TT | TT | TT | TT |
| Specific Density ( Ds) | g/cm | 2.63 | 2.63 | 2.65 | 2.64 | 2.66 | 2.65 | 2.65 | | | |
| Aparent density ( Da) | g/cm | 1.48 | 1.48 | 1.42 | 1.44 | 1.46 | 1.48 | 1.34 | | | |
| Total phorosity (Pt) | % | 43.7 | 43.7 | 46.7 | 45.5 | 45.1 | 44.2 | 49.4 | | | |
| Aeration phorosity (Pa) | % | 5.0 | 5.1 | 8.9 | 7.9 | 7.0 | 5.3 | 14.6 | | | |
| Higroscopical coefficient(CH) | % | 9.2 | 9.1 | 9.9 | 9.1 | 9.2 | 9.5 | 8.8 | | | |
| Fadind coefficient (CO) | % | 13.8 | 13.7 | 14.9 | 13.7 | 13.8 | 14.2 | 13.2 | | | |
| Field capacity (CC) | % | 26.1 | 26.1 | 26.4 | 26.1 | 26.1 | 26.2 | 26.0 | | | |
| Total capacity (CT) | % | 29.5 | 29.5 | 32.7 | 31.6 | 30.9 | 29.8 | 36.9 | | | |
| Utile water capacity ( CU) | % | 12.3 | 12.4 | 11.5 | 12.4 | 12.3 | 12.0 | 12.8 | | | |
| pH in water | | 5.95 | 6.10 | 6.20 | 6.55 | 6.70 | 7.10 | 7.70 | 8.20 | 8.25 | 8.15 |
| Carbonates ( $CaCO_3$) | % | | | | | | | 12.10 | 6.85 | 3.55 | 2.60 |
| Humus | % | 3.40 | 2.10 | 2.10 | 1.70 | 1.60 | 1.25 | 1.20 | 1.00 | 0.90 | 0.70 |
| Nitrogen index (IN) | | 3.06 | 1.91 | 1.95 | | | | | | | |
| Humus reserve (50 cm) | to/ha | 191.0 | | | | | | | | | |
| P mobile | ppm | 35.0 | 23.0 | 5.0 | 4.0 | 4.0 | 7.0 | 11.0 | 7.0 | 5.0 | 4.0 |
| K mobile | ppm | 153 | 128 | 128 | 123 | 113 | 136 | 113 | 98 | 113 | 113 |
| Exchanging bases (SB) | me/100 | 35.6 | 31.2 | 26.8 | | | | | | | |
| Exchange H (SH) | me/100 | 12.0 | 10.0 | 7.9 | | | | | | | |
| Saturation in base degree (V) | % | 90 | 91 | 93 | | | | | | | |
| Mobile aluminium | me/100 | 0.10 | 0.05 | 0.05 | | | | | | | |

The analyzed soil has an acid reaction (5,9 – 6,8) in the first 80 cm of the soil profile, neutral between 80- 125 cm and low alkaline between 125 – 200 cm depth.

The mobile phosphorus content (P) in the worked soil has medium values (35,0 ppm) at the limit of alert threshold (concerning the nutrition lack) the mobile potassium supply (K) having medium values (153 ppm), values which are lower on with the profile (Table 3).

The humus reserve in the first 50 cm is high, and the natrium index (I.N.) has medium values in the worked layer (Ap) and also in the 0 – 45 cm layer.

Soil's texture, a very stable physical feature, is medium clay on the whole profile. The Apparent Density (DA) has medium values in the worked layer from the classic system, high in the first 10 cm in no-till system and very high in the middling third of the soil profile in the two systems.

*Table 4*

Water reserve between 0-10 cm comparing with field capacity (CC=38.63 mm)

| Characteristic periods/ year | | Water reserve | | | | Differences | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | Wheat | | Maize | | Wheat | | Maize | |
| | | Classic | No-till | Classic | No-till | Classic | No-till | Classic | No-till |
| September-October | 2006 | 35,18 | 33,08 | 35,09 | 35,40 | -3,45 | -5,55 | -3,54 | -3,23 |
| | 2007 | 20,09 | 21,40 | 18,50 | 21,57 | -17,73 | -17,23 | -20,13 | -16,75 |
| | 2008 | 33,85 | 32,65 | 28,00 | 36,86 | -4,78 | -5,98 | -10,63 | -1,77 |
| | 2009 | 25,19 | 27,44 | 23,42 | 27,94 | -13,44 | -11,19 | -15,21 | -10,69 |
| | 2010 | 23,18 | 23,96 | 21,90 | 26,47 | -15,45 | -14,67 | -14,67 | -12,16 |
| November-March | 2006 | 34,07 | 39,90 | 34,87 | 35,27 | -4,56 | +1,27 | -3,76 | -3,36 |
| | 2007 | 26,61 | 28,24 | 20,41 | 21,31 | -12,02 | -10,39 | -18,22 | -17,32 |
| | 2008 | 29,39 | 36,48 | 28,97 | 34,70 | -9,24 | -2,15 | -9,66 | -3,93 |
| | 2009 | 31,40 | 34,51 | 34,16 | 36,90 | -4,23 | -4,12 | -4,47 | -1,73 |
| | 2010 | 30,88 | 27,19 | 30,63 | 27,62 | -7,75 | -11,44 | -8,00 | -11,01 |
| April | 2006 | 33,17 | 27,72 | 33,17 | 25,93 | -5,46 | -10,91 | -5,46 | -12,70 |
| | 2007 | 33,64 | 29,88 | 29,98 | 22,94 | -4,99 | -8,75 | -8,64 | -9,19 |
| | 2008 | 31,27 | 34,21 | 38,30 | 30,79 | -7,36 | -4,42 | -0,33 | -7,84 |
| | 2009 | 26,23 | 25,10 | 26,05 | 25,58 | -12,40 | -13,53 | -12,58 | -13,05 |
| | 2010 | 30,15 | 31,40 | 30,60 | 30,49 | -8,48 | -7,23 | -8,03 | -8,14 |
| May- July | 2006 | 16,92 | 15,72 | 17,67 | 15,45 | -21,71 | -22,91 | -20,96 | -23,18 |
| | 2007 | 31,92 | 31,11 | 30,34 | 20,65 | -6,66 | -7,52 | -8,29 | -12,58 |
| | 2008 | 15,68 | 15,87 | 15,18 | 18,90 | -22,95 | -22,76 | -23,45 | -19,73 |
| | 2009 | 28,72 | 29,94 | 27,89 | 27,20 | -9,91 | -8,69 | -10,74 | -11,43 |
| | 2010 | 14,05 | 23,33 | 23,45 | 20,43 | -24,58 | -15,30 | -15,18 | -18,20 |
| August | 2006 | 29,44 | 28,80 | 26,14 | 29,24 | -9,19 | -9,03 | -12,49 | -9,38 |
| | 2007 | 25,81 | 25,38 | 25,65 | 25,43 | -12,82 | -13,25 | -12,98 | -13,20 |
| | 2008 | 18,16 | 23,00 | 22,36 | 24,32 | -20,47 | -15,63 | -16,27 | -14,31 |
| | 2009 | 27,31 | 28,17 | 27,54 | 26,35 | -11,32 | -10,46 | -11,09 | 12,38 |
| | 2010 | 12,94 | 18,40 | 19,43 | 18,21 | -25,69 | -20,23 | -19,20 | -20,42 |

*Table 5*

Water reserve between 0-25 cm comparing with field capacity (CC=96,57 mm)

| Characteristic periods/ Year | | Water reserve | | | | Differences | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | Wheat | | Maize | | Wheat | | Maize | |
| | | Classic | No-till | Classic | No-till | Classic | No-till | Classic | No-till |
| September-October | 2006 | 87,59 | 84,83 | 84,40 | 84,84 | -8,98 | -11,47 | -12,17 | -11,73 |
| | 2007 | 32,97 | 52,68 | 45,94 | 52,86 | -63,60 | -43,89 | -50,63 | -43,71 |
| | 2008 | 85,92 | 81,19 | 75,79 | 92,32 | -10,65 | -15,38 | -20,27 | -4,25 |
| | 2009 | 64,97 | 65,93 | 63,01 | 69,94 | -31,60 | 30,64 | -33,56 | -26,63 |
| | 2010 | 59,66 | 58,09 | 58,63 | 60,86 | -36,91 | -38,48 | -37,94 | -35,71 |
| November-March | 2006 | 82,23 | 88,30 | 87,62 | 86,37 | -14,24 | -8,27 | -8,95 | -10,20 |
| | 2007 | 70,10 | 72,75 | 54,78 | 55,39 | -26,47 | -23,82 | -41,79 | -41,18 |
| | 2008 | 79,67 | 86,60 | 78,29 | 88,92 | -16,90 | -9,97 | -18,28 | -7,65 |
| | 2009 | 77,11 | 86,25 | 92,80 | 90,42 | -19,46 | -10,32 | -3,77 | -6,15 |
| | 2010 | 75,74 | 70,45 | 75,21 | 60,86 | -20,83 | -26,12 | -21,36 | -35,71 |
| April | 2006 | 80,63 | 74,54 | 81,08 | 71,46 | -15,94 | -22,03 | -15,49 | -25,11 |
| | 2007 | 69,49 | 67,24 | 62,88 | 61,92 | -27,08 | -29,33 | -33,69 | -34,65 |
| | 2008 | 82,56 | 84,95 | 93,99 | 81,86 | -14,01 | -11,62 | -2,58 | -14,71 |
| | 2009 | 66,69 | 66,73 | 71,53 | 73,82 | -29,61 | -29,84 | -25,04 | -22,75 |
| | 2010 | 82,85 | 82,53 | 81,86 | 80,70 | -13,72 | -14,04 | -14,71 | -15,87 |
| May- July | 2006 | 45,47 | 40,07 | 46,04 | 40,43 | -51,1 | -56,50 | -50,53 | -56,14 |
| | 2007 | 80,52 | 70,74 | 66,64 | 73,36 | -16,05 | -25,83 | -29,93 | -23,21 |
| | 2008 | 55,88 | 48,09 | 45,19 | 55,36 | -40,69 | -48,48 | -51,38 | -41,21 |
| | 2009 | 83,93 | 74,42 | 79,70 | 68,76 | -12,64 | -22,15 | -16,87 | -27,81 |
| | 2010 | 36,35 | 60,49 | 68,61 | 54,58 | -60,22 | -36,08 | -27,96 | -41,99 |
| August | 2006 | 69,47 | 70,82 | 62,22 | 76,19 | -27,1 | -25,75 | -34,35 | -20,38 |
| | 2007 | 60,35 | 63,68 | 53,80 | 64,26 | -36,22 | -32,89 | -42,77 | -32,31 |
| | 2008 | 55,63 | 61,07 | 56,85 | 64,04 | -40,94 | -35,50 | -39,72 | -32,53 |
| | 2009 | 77,42 | 69,26 | 72,17 | 65,19 | -19,15 | -27,31 | -24,40 | -31,38 |
| | 2010 | 30,08 | 45,90 | 48,47 | 44,23 | -66,49 | -50,67 | -48,10 | -52,34 |

The Total Porosity (PT) has low values in the 0 – 33 cm interval, and also in the 45 – 96 cm one. The aeration porosity, which represents all the pores occupied with air when the soil is in optimum humidity conditions, has very low values, excepting the worked layer from the classic system, where it has low values and the first 10 cm depth in No-till system where the values are very low (DICU, 2010).

Considering the evolution of soil humidity, the observations made monthly (by taking soil samples and laboratory determinations) for the cultures showed that in the no-till system, there are more uniform values in the soil profile (Table 4).

The range 0-25 cm soil moisture values were higher in the start of the agricultural year in the classic system, in both cultures, while in spring they reached the same values and exceeding from April to August, recorded higher values in no- till system (Table 5).

In the first 50 cm of soil profile, between September to March, the water supply recorded higher values in traditional culture system, in both cultures.

Since April we have seen an increase of water supply in no-till culture system, in both cultures, in the summer months it will be quite significant enough quantity, because high capacity retention due to no-till system (Tab. 6).

*Table 6*

Water reserve between 0-50 cm comparing with field capacity (CC=191,73 mm)

| Characteristic periods/ Year | | Water reserve | | | | Differences | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | Wheat | | Maize | | Wheat | | Maize | |
| | | Classic | No-till | Classic | No-till | Classic | No-till | Classic | No-till |
| September-October | 2006 | 203,81 | 173,90 | 171,26 | 171,19 | +12,08 | -17,83 | -20,48 | -20,54 |
| | 2007 | 108,87 | 106,55 | 96,29 | 109,92 | -82,86 | -85,18 | -95,44 | -81,80 |
| | 2008 | 172,15 | 166,79 | 155,90 | 191,38 | -19,58 | -24,94 | -35,83 | -0,35 |
| | 2009 | 133,84 | 129,83 | 107,64 | 139,38 | -57,89 | -61,90 | -84,09 | -52,35 |
| | 2010 | 121,68 | 120,42 | 121,08 | 114,15 | -70,05 | -71,31 | -70,65 | -77,58 |
| November-March | 2006 | 168,68 | 172,18 | 172,12 | 168,91 | -23,05 | -19,55 | -19,61 | -22,82 |
| | 2007 | 157,39 | 156,60 | 116,51 | 128,51 | -34,34 | -35,13 | -75,22 | -63,23 |
| | 2008 | 170,05 | 172,42 | 168,09 | 179,16 | -21,68 | -21,68 | -23,64 | -12,57 |
| | 2009 | 152,22 | 180,18 | 190,76 | 182,06 | 39,51 | -11,55 | -0,97 | -9,67 |
| | 2010 | 154,38 | 152,93 | 152,18 | 150,10 | -37,35 | -38,80 | -39,55 | -41,63 |
| April | 2006 | 168,39 | 157,30 | 166,81 | 149,69 | -23,33 | -34,43 | -24,92 | -42,04 |
| | 2007 | 140,40 | 137,67 | 120,41 | 113,25 | -51,33 | -54,05 | -71,31 | -78,48 |
| | 2008 | 169,14 | 168,37 | 181,52 | 174,19 | -22,59 | -23,36 | -10,21 | -17,54 |
| | 2009 | 140,05 | 149,01 | 145,51 | 154,01 | 51,68 | -42,72 | -46,22 | -37,72 |
| | 2010 | 167,22 | 168,17 | 164,99 | 165,99 | -24,51 | -23,56 | -26,74 | -25,74 |
| May- July | 2006 | 82,92 | 78,50 | 82,02 | 77,91 | -108,81 | -113,23 | -109,71 | -113,82 |
| | 2007 | 160,89 | 131,68 | 122,28 | 145,14 | -30,84 | -60,06 | -69,44 | -46,58 |
| | 2008 | 161,48 | 141,98 | 115,29 | 128,09 | -30,25 | -49,75 | -76,44 | -63,44 |
| | 2009 | 167,00 | 158,84 | 158,54 | 150,53 | -24,73 | -32,89 | -33,19 | -41,20 |
| | 2010 | 78,73 | 135,74 | 152,17 | 133,27 | -113,0 | -55,99 | -39,56 | -58,46 |
| August | 2006 | 143,38 | 133,08 | 124,61 | 168,37 | -48,35 | -58,70 | -67,12 | -23,34 |
| | 2007 | 109,40 | 119,94 | 101,29 | 122,80 | -82,33 | -71,80 | -90,44 | -68,92 |
| | 2008 | 134,35 | 141,37 | 134,29 | 139,63 | -57,38 | -50,36 | -57,44 | -52,10 |
| | 2009 | 154,93 | 147,94 | 145,27 | 147,42 | -36,80 | -43,79 | -46,46 | -44,31 |
| | 2010 | 64,43 | 99,03 | 103,07 | 81,98 | -127,10 | -92,70 | -88,66 | -109,75 |

In no- tillage, the values of soil moisture are more uniform in the soil profile and are higher comparing with the classical system, results obtained also by DERPSCH (2000), FHILIPS et al. (1980), LAL (1995).

In central areas of the Sub-Humid Pampas of Argentina, when comparing No Till with conventional tillage, it was found that an average of around three inches of crop usable water could be annually gained into the soil profile (DARDANELLI, 1998).

For corn and some other crops grown on some long term (fifteen years) no- till farm operations, nowadays we have some empirical evidences that show higher values for the water efficiency use than that reported by TOTIS DE ZELJCOVICH in 1984.

The enlarged soil water capturing ability developed by No Till is also very useful to diminish the water run off and consequently to reduce the eroding forces and contamination capacity (DUMITRU, 1999).

DRĂGOI (2005) considered that no-till technology greatly contribute to minimize the yield impacts caused by water stressing periods allowing to obtain higher and less variable crop yields.

No-till can significantly contribute to reduce the amount of water needed to develop a given crop. The reduction of the water run off and the consequent reduction –or avoidance- of soil erosion, the crop residues covering the topsoil create a favorable environment for a significant increase of the biological activity that further improves the soil and general agro-ecosystem functioning (HALLETT et al., 2001).

PEIRETTI et al., (2001) shows that on soil properly managed utilizing the No Till principles for the last fifteen years, significant progresses had been achieved on both water management and general soil and agro ecosystem functioning.

## CONCLUSIONS

Implementation of new agricultural technologies requires knowledge of the suitability of natural conditions for the tested culture system, in areas of good favorability for the plant, given the limitations of some factors can have on agricultural ecosystem, particularly edaphic factors. In assessing the suitability of land for cultivation systems are taken into account at least two soil determining factors, which determine the degree of suitability, the soil texture and soil moisture.

Estimating factors can be based on the information contained in existing soil surveys filled with experience in the field, highlighting the impact of technology system on the physical properties of soil and plant production.

The results obtained indicate that the full and correct utilization of the No Till system principles along with a systemic approach, can significantly contribute to improve the water-soil-plant multiple relationship and at the same time be improving the general agro-ecosystem productivity and sustainability.

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