Original scientific paper

INFLUENCE OF DRAINAGE ON YIELDS OF WHEAT AND MAIZE CULTIVATED ON PSEUDOGLEY

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In the area of experimental drainage field Varna near Šabac, owned by Institute of soil science, in the period od 1991-2003 on plots with and without pipe drainage the yields of wheat and maize were registered. The yields of both cultivated srops were higher on the plots with pipe drainage, which confirm the efficiency of horizontal pipe drainage application on pseudogley type od soil.

*Key words:*pseudogley, horizontal pipe drainage, yields, wheat, maize

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INTRODUCTION

The yields of wheat and maize on the plots of experimental drainage field Varna owned by Institute of soil science were observed during period from 1991.- 2003. During this period yields were measured and calculated for control plot and for the plot with drainage pipes with spacing of 25m. Results were analyzed and commented.

MATERIL AND METHODS

During the period of observation wheat and maize were growth in rotation. All plots, with and without implemented pipe drainage, belongs to experimental field and for all plots same agro technical measures were performed.

Yields were calculated using volume method. The analysis of collected data was presented in tables and in combined graphics with precipitations and yields for the period of observation. All collected data was elaborate with statistical methods.

OBSERVATION RESULTS

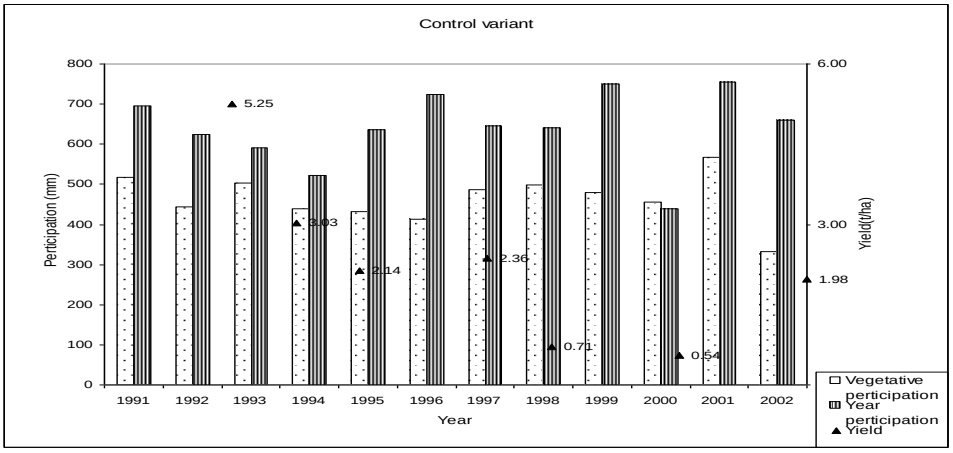
Table 1.shows yields during the observation period.

Table 1.Yield on the sample plot Varna

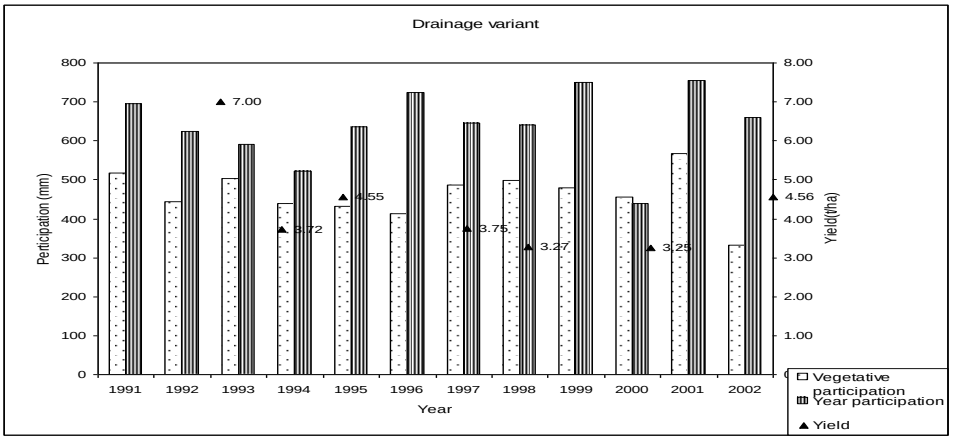
Year	Culture	Average yield(t/ha)		Increasing of yields	
		Control	Plot with drainage	t/ha	(%)
1991.	Maize	3.06	3.55	0.49	16
1992.	Maize	/	/	/	/
1993.	Wheat	5.25	7.00	1.75	33
1993.	Maize	3.71	4.77	1.06	29
1994.	Wheat	3.03	3.72	0.69	23
1994.	Maize	2.28	3.18	0.90	39
1995.	Wheat	4.14	4.55	0.41	10
1996.	Maize	2.80	3.58	1.05	28
1997.	Wheat	2.36	3.75	1.39	59
1998	Wheat	2.71	3.27	0.56	21
1999.	Maize	4.82	5.24	0.42	9
2000.	Wheat	2.54	3.25	0.71	28
2001.	Maize	2.82	3.98	1.16	41
2002.	Wheat	3.98	4.56	0.58	15
2003.	Maize	2.65	3.53	0.88	33

Yields in 1992. were not presented due to inadequate usage of agro technical and agro chemical measures during that year. Variation of yields during the period of observation have showed trend. The factors which have main impact on variation were insufficient resources and assets for normal implementation of agro technical measures during the period of observation.

Picture 1. and 2. presents yields of wheat and precipitation in hydrological year and in the vegetation season for control plot and for the plot with drainage pipes with spacing of 25m.



Picture 1.- Yields of wheat and registered precipitation on control plot



Picture 2.- Yields of wheat and registered precipitation on plot with drainage

The correlation of wheat yield and the recorded rainfall in the framework of the study variants is presented in Figures 3 and 4.

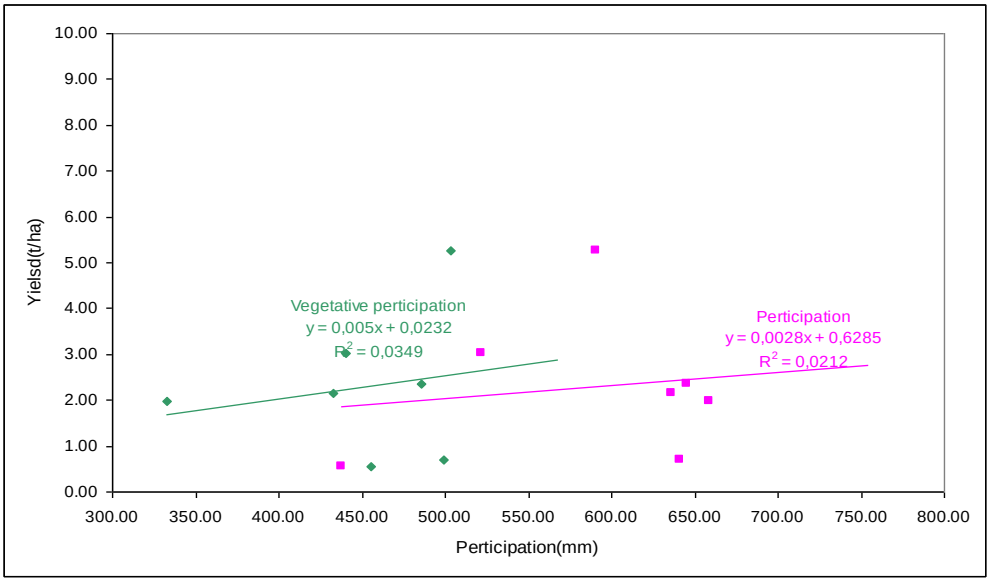


Figure 3. – The correlation of wheat yield and rainfall-control

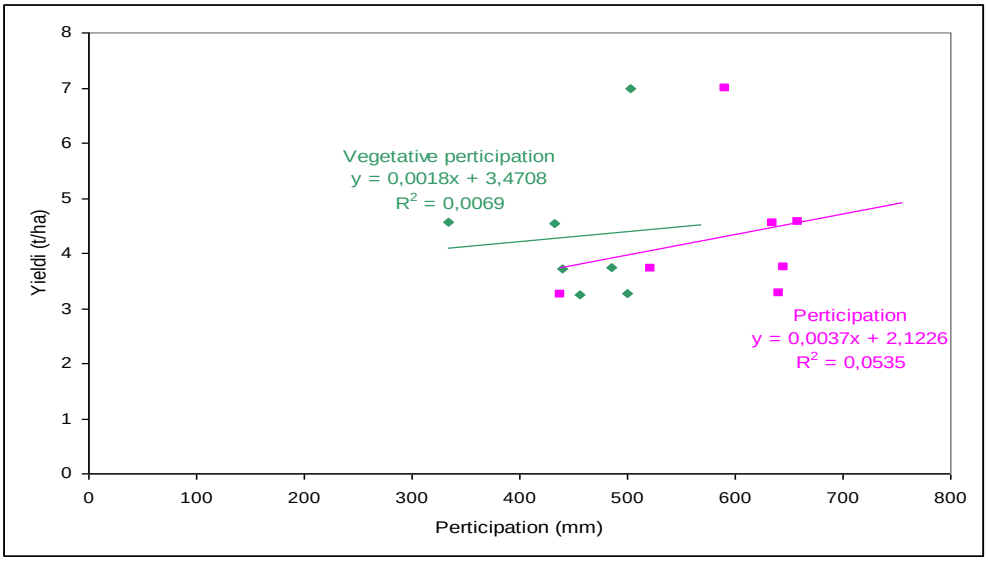


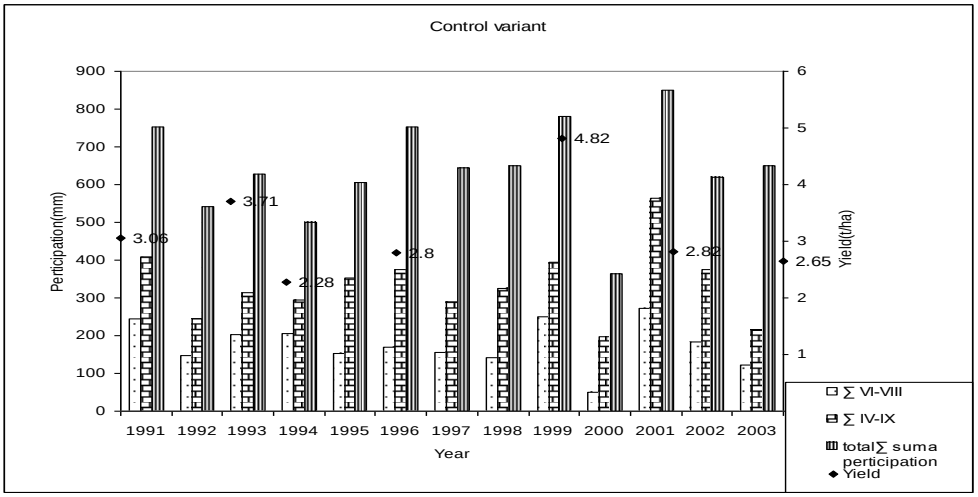
Figure 4. – The correlation of wheat yield and rainfall-25m drain spacing

The dependence of wheat yield on growing season rainfall (October-June) and total rainfall (October of the previous year - October of the current year of the harvest), is calculated by the linear function of the general form $y = ax+b$. The correlation is described by the correlation coefficient (r).

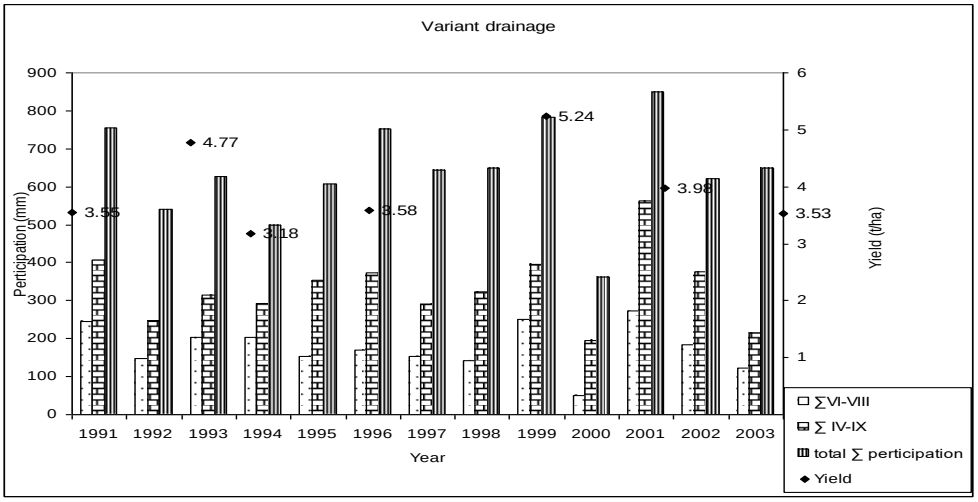
The wheat yield is directly proportional to growing season rainfall and total rainfall, with low correlation coefficients (r), which are 0.18, and 0.14 respectively, which shows that the correlation is stronger in the first case.

The wheat yield on the variant of 25-metre drain spacing is directly proportional to both growing season and total rainfall. Correlation coefficients (r) are very low: for growing season rainfall it is 0.08, for total rainfall it is somewhat higher - 0.23.

The maize yields and rainfall volumes during summer, growing season and annual periods, for the control plot and the plot with 25-metre drain spacing are presented in Figures 5 and 6.



Picture 5.- Yields of maize and registered precipitation on control



Picture 6.- Yields of maize and registered precipitation on plot with drainage

Figures 7 and 8 present the correlation of maize yield and rainfall on the control plot and on the drainage variant with 25-metre spacing.

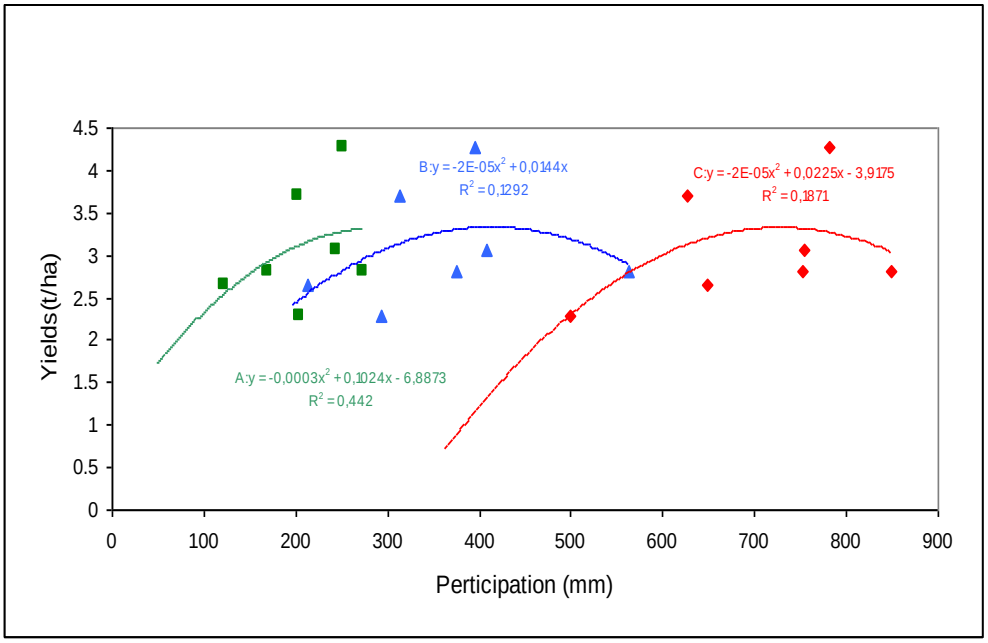


Figure 7. – The correlation of maize yield and rainfall-control

The dependence is determined by the polynomial curve of the second order. The symbol of each variant is followed by the function of the polynomial curve as well as the square Pearson's correlation coefficient.

In all three variants of the series monitoring the dependence of yields on rainfall, there was a positive correlation of the dependence of yield on rainfall volume during the summer period, the vegetation period and total rainfall. The correlation is not significant in any of the variants.

In the variant A, the value of the square correlation coefficient is 0.442, which is the highest value. It is followed by variant C with the coefficient 0.1871 and then variant B with the coefficient 0.1292.

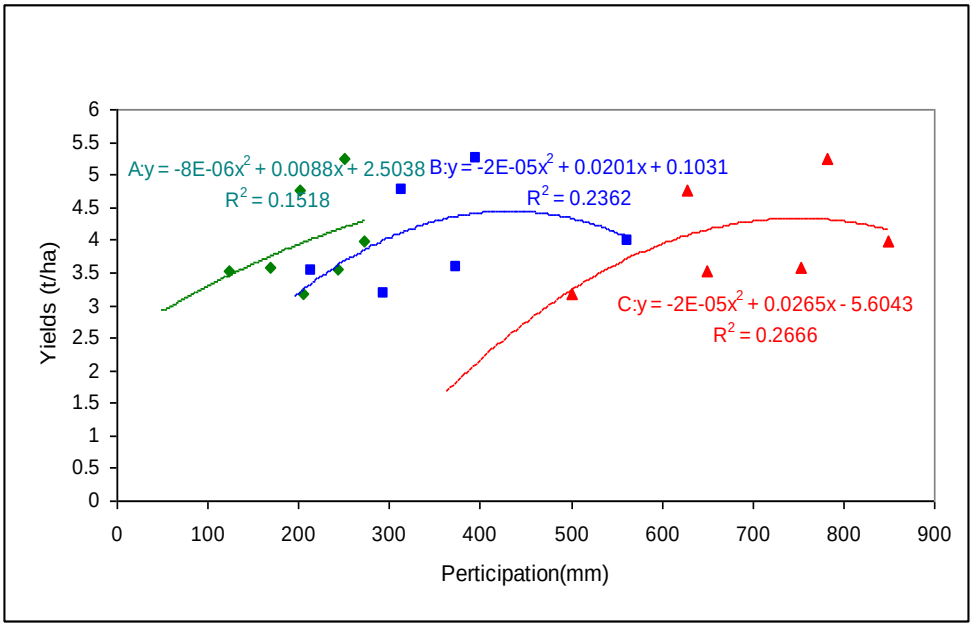


Figure 8. – The correlation of maize yield and rainfall-25m drain spacing

In all three variants of the series monitoring the dependence of yields on rainfall, there was a positive correlation of the dependence of yield on rainfall volume during the summer period, the vegetation period and total rainfall. The correlation is not significant in any of the variants.

In the variant C, the value of the square correlation coefficient is 0.2666, which is the highest value. It is followed by variant B with 0.2362 and then variant A with the coefficient 0.1518.

CONCLUSION

Yields in the period 1991.-2003., shows that on the plots where drainage was implemented, rising of average yield of wheat was registered from 10-59%, depending of seed material, type of implemented agro technical measures and productiveness of the year, comparing the plots without drainage – control plots. Rising of average yields of maize during observation period, comparing the plots with drainage and control plots was 9-41%, depending of same facts as for wheat.

Obtain results shows that implementation of pipe drainage on pseudogley soils is one of the measures that can result of raising economic results in intensive agricultural production on soils with limited fertility.

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UTICAJ ODVODNJAVANJA PSEUDOGLEJA NA PRINOS PŠENICE I KUKURUZA

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Na zemljištu tipa pseudoglej oglednog drenažnog polja Instituta za zemljište Varna kod Šapca, u periodu od 1991. do 2003. godine vršeno je praćenje ostvarenih visina prinosa pšenice i kukuruza. Registrovane su prosečne vrednosti gajenih kultura na kontrolnoj varijanti, u okviru koje nije izvedena cevna drenaža i na parcelama na kojima je cevna drenaža izvedena sa rastojanjem drenova od 25 metara.

Pšenica i kukuruz su tokom perioda osmatranja gajeni u plodosmeni. Sve parcele, kako drenirane tako i nedrenirane nalaze se u okviru oglednog polja. Na njima su primenjivane standardno jednake agrotehničke mere.

Variranje veličina ostvarenih prinosa, tokom perioda osmatranja zavisilo je od trenutnih sociooekonomskih uslova i raspoloživih sredstava za izvođenje svih potrebnih agrotehničkih mera.

Utvrđeni prinosi tokom osmatranja, pokazuju da je na parcelama na kojima je izvedena cevna drenaža zabeleženo povećanje prinosa pšenice od 10-59%, zavisno od semenskog materijala, primenjenih agrotehničkih mera i rodnosti godine, u odnosu na nedreniranu parcelu.

Zabeleženo povećanje prinosa kukuruza na dreniranoj parceli iznosilo je 9-41%, a bilo je uslovljeno kao i kod gajenja pšenice od faktora sredine i primenjene agrotehnike.

Zaključci koji su proistekli iz obrade prikupljenih podataka sprovedenih istraživanja, ukazuju da se izvođenjem cevne drenaže na zemljištu tipa pseudoglej, mogu obezbediti optimalni uslovi za prevazilaženje svih ograničenja pri obradi i intenzivnom korišćenju ispitivanog tipa zemljišta u cilju ekonomske isplativosti izvedenih mera.